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THE VIRGINIA JOURNAL OF SCIENCE

A JOURNAL ISSUED QUARTERLY BY THE
VIRGINIA ACADEMY OF SCIENCE

PROCEEDINGS FOR THE YEAR

1952-1953

l. 4, New Series September, 1953 No. 4

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VOL. 4, NEW SERIES SEPTEMBER, 1953 No. 4

THE VIRGINIA JOURNAL OF SCIENCE

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THE VIRGINIA JOURNAL OF SCIENCE

VOL. 4, NEW SERIES No. 4

VIRGINIA ACADEMY OF SCIENCE

Proceedings for the Year 1952--1953

MINUTES OF THE THIRTY-FIRST ANNUAL MEETING

MAY 6, 7, 8, 9, 1953

AT VIRGINIA MILITARY INSTITUTE

LEXINGTON, VIRGINIA

LIST OF PRESIDENTS

IVEY F. LEWIS	1923-24
JAMES LEWIS HOWE	1924-25
ROBERT E. LOVING	1925-26
*J. SHELTON HORSLEY	1926-27
*DONALD W. DAVIS	1927-28
WM. MOSELEY BROWN	1928-29
GARNETT RYLAND	1929-30
L. G. HOXTON	1930-31
I. D. WILSON	1931-32
T. MCN. SIMPSON, JR.	1932-33
WILLIAM A. KEPNER	1933-34
WILLIAM T. SANGER	1934-35
IDA SITLER	1935-36
H. E. JORDAN	1936-37
D. MAURICE ALLAN	1937-38
EARLE B. NORRIS	1938-39
RUSKIN S. FREER	1939-40
*WORTLEY F. RUDD	1940-41
GEORGE W. JEFFERS	1941-42
MARCELLUS H. STOW	1942-43
*W. CATESBY JONES	1943-44
ROBERT F. SMART	1944-45
H. RUPERT HANMER	1945-46
ARTHUR BEVAN	1946-47
JESSE W. BEAMS	1947-48
SIDNEY S. NEGUS	1948-49
BOYD HARSHBARGER	1949-50
GUY W. HORSLEY	1950-51
PAUL M. PATTERSON	1951-52
LLOYD C. BIRD	1952-53
ALLAN T. GWATHMEY	1953-54
IRVING G. FOSTER	1954-55

* Deceased

Virginia Academy of Science

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VIRGINIA MILITARY INSTITUTE
WILLIAM H. MILTON, *Superintendent*

COMMITTEES OF THE VIRGINIA ACADEMY OF SCIENCE FOR 1953-54

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(Elected by Sections)

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Agricultural Sciences: H. Marshall Clark, Chairman; Rodney C. Berry, Vice-Chairman; R. W. Engel, Secretary; Wesley P. Judkins, Section Editor (1956).

Astronomy, Mathematics, and Physics: L. W. Webb, Jr., Chairman; H. Y. Loh, Secretary; I. G. Foster, Section Editor (1956).

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Psychology: Stanley B. Williams, President; Hannah S. Davies, Secretary-Treasurer; Reuben S. Horlick, Executive Committeeman; R. H. Henneman, Section Editor (1954).

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Statistics: Ralph A. Bradley, Chairman; William Cooke, Vice-President; C. Y. Kramer, Secretary; W. A. Hendricks, Section Editor (1954).

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Madison College, Harrisonburg

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James W. Cole

PLACE OF MEETING

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Byron N. Cooper	William M. Hinton	George W. Jeffers
F. D. Kizer	Robert O. Nelson	Percy H. Warren

VIRGINIA JOURNAL OF SCIENCE

(*Elected by Council*)

Boyd Harshbarger, Editor-in-Chief
Virginia Polytechnic Institute, Blacksburg
Horton H. Hobbs, Jr., Technical Editor
Mary E. Humphreys, Assistant Technical Editor

SECTION EDITORS

(*Elected by Sections*)

Wesley P. Judkins	Agricultural Sciences
I. G. Foster	Astronomy, Mathematics and Physics
J. Douglas Reid	Bacteriology
Robert T. Brumfield	Biology
Carl J. Likes	Chemistry
Francis G. Lankford, Jr.	Education
Robert Hubbard	Engineering
W. D. Lowry	Geology
Ebbe C. Hoff	Medical Sciences
Richard H. Henneman	Psychology
L. W. Jarman	Science Teachers
Walter Hendricks	Statistics

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JEFFERSON MEDAL WINNERS

RECIPIENTS OF THE JEFFERSON GOLD MEDAL [1]

Alfred Chanutin	1936
William B. Porter	1937
H. M. Phillips	1938
G. M. Shear and H. D. Ussery	1939

RECIPIENTS OF THE JEFFERSON PRIZE [2]

L. G. Overholzer and John H. Yoe	1940
Allan T. Gwathmey	1941
R. N. Jefferson	1942
W. H. Hough	1943
Clinton B. Cosby	1944

RECIPIENTS OF J. SHELTON HORSLEY RESEARCH AWARDS

CARL C. SPEIDEL	1927
JOHN H. YOE	1928
J. C. STREET	1929
H. E. JORDAN	
CARL C. SPEIDEL	1930
E. C. STEVENSON	1931
JAMES H. SMITH	1932
S. A. WINGARD	1933
E. P. JOHNSON	1934
MARGARET HESS	1935
ALFRED CHANUTIN	1936
R. G. HENDERSON	1937
S. G. BEDELL	1938
M. J. MURRAY	
F. F. CLEVELAND	1939
WALTON C. GREGORY	1940
CHARLES RAY	1941
NO AWARD	1942
J. B. MEYER	1943
J. H. TAYLOR	1944
NO AWARD	1945

[1] The winning papers in this competition were entered against those of the North Carolina, South Carolina, Georgia and Florida Academies of Science. It was discontinued in 1940.

[2] The winning authors had the choice of the Jefferson Prize or the Academy Prize during this period. The name of the Academy Prize was changed to the J. Shelton Horsley Award; and the Jefferson Prize discontinued in 1944.

BOYD HARSHBARGER

D. B. DELURY (separate papers) 1946
NO AWARD 1947
HENRY LEIDHEISER, JR. 1948
WALTER S. FLORY, JR. 1949
ERLING S. HEGRE 1950
DAVID B. DUNCAN 1951
D. R. H. GOURLEY 1952
STEPHEN BERKO
FRANK L. HEREFORD 1953

General Program of the Thirty-First Annual Meeting 1 9 5 3

VIRGINIA MILITARY INSTITUTE

LEXINGTON, VIRGINIA

WEDNESDAY, MAY 6

3:00 P.M. to 8:00 P.M. – Registration for Junior Academy members, participants in the Science Talent Search, Academy members, and guests, Room 354, Mallory Hall.

3:00 P.M. to 8:00 P.M. – Setting up Exhibits: Commercial, Rooms 335, 341, Mallory Hall; Free, Room 359, Mallory Hall; Junior Academy, Rooms 435, 441, 459, Mallory Hall.

THURSDAY, MAY 7

8:00 A.M. to 8:00 P.M. – Registration for Junior and Senior Academy members and guests, Room 354, Mallory Hall.

9:00 A.M. – Meeting of Science Exhibit Judges; Room 434, Mallory Hall.

9:30 A.M. – Meeting of chairman and exhibitors; Room 434, Mallory Hall.

10:00 A.M. to 12:30 P.M. and 1:30 P.M. to 4:00 P.M. – Meeting of Finalists of Talent Search with Chairman and interviewers; Rooms 434, 442, 454, 242, 249, 252, Mallory Hall.

10:00 A.M. to 12:30 P.M., 1:30 P.M. to 4:00 P.M. – Judging of Science Exhibit Contests; Rooms 45, 441, 459, Mallory Hall.

3:00 P.M. – Meeting of the Talent Search Committee; Room 434, Mallory Hall.

3:30 P.M. – Meeting of all Senior Academy Section Officers; Room 257, Mallory Hall.

4:00 P.M. – Meeting of the Section Editors, Room 237, Mallory Hall.

4:30 P.M. – Regimental Parade, Parade Ground.

5:00 P.M. – Senior Academy Conference and General Meeting; Room 111, Mallory Hall.

7:30 P.M. to 8:30 P.M. – Business meeting, Junior Academy of Science; Auditorium, Preston Library.

8:30 P.M. – General Electric "House of Magic" for Junior Academy members and guests; Jackson Memorial Hall.

FRIDAY, MAY 8

8:00 A.M. to 6:00 P.M. — Registration; Room 354, Mallory Hall.

9:00 A.M. — Section Meetings: Agricultural Sciences, Room 234, Mallory Hall; Astronomy, Mathematics, Physics, Room 111, Mallory Hall; Bacteriology, Room 44, Mallory Hall; Biology, Room 147, Mallory Hall; Chemistry, Room 102, Maury-Brooke Hall; Education, Room 454, Mallory Hall; Engineering, Room 105, Nichols Engineering Hall, Geology, Room 249, Mallory Hall; Medical Science, Room 442, Mallory Hall; Psychology, Room 18, Scott-Shipp Hall; Science Teachers, Room 252, Mallory Hall; Statistics, Room 237, Mallory Hall.

10:30 A.M. — Presentation of awards, Junior Academy; student presentation of exhibits. Address by John C. Fisher, Metallurgy Research Department, General Electric Company, Auditorium, Preston Library.

12:30 P.M. — Group Luncheons.

2:00 P.M. — Section Meetings.

3:30 P.M. to 4:45 P.M. — Symposium "Resource Use Education", sponsored by Virginia Resources Use Education Council, Lecture, Old Science Hall.

4:30 P.M. to 6:00 P.M. — Superintendent's Reception for members and guests of the Academy; Alumni Hall.

7:30 P.M. — Business Meeting, Senior Academy, Room 147, Mallory Hall.

8:30 P.M. Address by Professor Hubert N. Alyea, Frick Chemistry Laboratory, Princeton University, "ATOMIC ENERGY: WEAPON FOR PEACE."

SATURDAY, MAY 9

9:00 A.M. — Section Meetings.

10:00 A.M. — Academy Council Meetings; Room 631, Preston Library.

2:00 P.M. — Field trips.

MINUTES OF THE COUNCIL MEETING
MAY 9, 1953

A meeting of the Council of the Virginia Academy of Science was held in Room 631, Preston Library, Virginia Military Institute, 10:00 A.M., May 9, 1953. Presented were Lloyd C. Bird; I. G. Foster; Boyd Harshbarger; Horton H. Hobbs; Ladley Husted; Sidney S. Negus; Paul M. Patterson, and Foley F. Smith. President Allan T. Gwathmey presided.

Minutes of the last meeting were read and approved. Boyd Harshbarger suggested that a biographical sketch with picture of the Honorary members be carried in the Virginia Journal of Science upon their election as such. This was made as a motion and properly seconded and passed. Ladley Husted suggested that a plaque be placed at the Botanical Garden at the University of Virginia, honoring Ivey F. Lewis, a Past President of the Academy, and Honorary member. A committee was appointed by the President consisting of Messers. Husted, Strickland, and Carroll to investigate the cost of such a memorial.

President Gwathmey discussed standardizing procedure concerning the operation of the Junior Academy of Science for the next meeting; meaning that operational rules and procedures be stabilized as a guide for future members and chairmen of this committee. The President appointed the following Committee to study this problem and make a formal report to Council at the next meeting: Edward Harlow, Edward Dyer, Mrs. Thelma Heatwole, and I. G. Foster, Chairman.

It was suggested that the Section Chairman be asked to work up their respective programs for the next meeting with a view of receiving some papers in that section which might have science news value. Mr. Robert Jeffreys, Public Relations Officer for the Virginia Military Institute, offered suggestions for securing newsworthy papers previous to the meeting in order that newspapers would be advised of their content in time to get some publicity before and during the meeting rather than following it.

The President said he would appoint a Committee on Public Information, which would contact the Section Edtiors and suggest getting the program together far enough in advance for the screening of papers. This committee was to report at the next meeting of the Council.

President Gwathmey announced that Fred Young had been appointed Chairman of the Committee for Local Arrangements for the Charlottesville meeting for 1954.

It was moved, seconded, and passed that the Committee on Collegiate Activities be abolished.

The meeting adjourned at 12 P.M.

FOLEY F. SMITH, *Secretary.*

MINUTES OF THE ACADEMY CONFERENCE MAY 7, 1953

The Annual Meeting of the Academy Conference was held in Room 111, Mallory Hall, Virginia Military Institute, Thursday, May 7, 1953, at 5:00 P.M. A quorum of more than forty members being present, President Lloyd C. Bird called the meeting to order and introduced Colonel Anderson, who welcomed the Virginia Academy of Science on behalf of the Virginia Military Institute.

Colonel Heflin, Chairman of the Local Committee on Arrangements, made several announcements pertaining to changes in the program and meeting room arrangements.

President Bird then introduced Dr. James W. Cole, who brought greetings from the National Science Foundation to the Virginia Academy of Science, on the occasion of its Thirty-First Annual Meeting.

It was moved, seconded, and passed, that the change in the Constitution, notice of which was previously published in the Virginia Journal of Science, effecting Section II, Article 11 of the Constitution be changed to read: "that the fiscal year of this organization shall be from January 1 to December 31"; this change making the fiscal year of the Academy coincide with the calendar year.

President Bird discussed the necessity for having facilities for mailing notices, etc., to the various sections. In order to do this it would be necessary to bring the present addressograph plates used by the Virginia Journal of Science up to date, so that they could be tabbed for selective use by sections of the Academy, thus enabling the Academy to render better service to the various sections when they should require it.

Bringing the addressograph plates to Richmond and placing them in the hands of direct mailing service would require a change in the By-Laws, notice of which has already been made by publication in the Virginia Journal of Science. The change is to be made by the elimination of the phrase "shall make all new address plates"; from sub-section 3 of Section 3, of the By-laws. Editor-in-Cheif Boyd Harshbarger requested the following expression from him be inserted in the Minutes:

"I would be in favor of it provided that:

(1) The Editor-in-Chief of the Journal send all changes of address directly to the firm with the addressograph contract and that a duplicate copy of such changes be sent at the same time to the secretary of the Academy.

(2) That the secretary in adding names to the existing list send copies to both the addressograph firm and the Editor-in-Chief and that no names be added except when accompanied by two dollars ($2.00) to the Editor-in-Chief for the Journal."

President Bird discussed the origin and background of the Academy Conference and how it afforded an opportunity for all members of the Academy to discuss various problems concerning the various sections and

allowed the officers to make their annual reports. As the Academy grew, however, the Conference became unwieldy, and in order to cut down the time-consuming reading of reports the Council recommended that the committee reports be mimeographed and made available for those members registering at the Annual Meeting.

The reports of the Secretary-Treasurer and those of various committees follow:

President Bird introduced President-Elect Allan T. Gwathmey, after which the meeting adjourned at 6:05 P.M.

FOLEY F. SMITH, *Secretary.*

REPORT OF THE SECRETARY-TREASURER

The report of the auditor reviewing the accounts and finances of the Academy for the past fiscal year is included in the Committee reports. The Finance Committee has studied this report and their comments will be made in their report and in the presentation of the budget.

This year, the Junior Academy of Science Committee, under the able direction of Mrs. Thelma G. Heatwole, and the Science Talent Search Committee, under the direction of Mr. Edward Dyer, of the University of Virginia, combined their committees to effect more efficient operation for these very important Academy functions. The two Chairmen of this committee are to be congratulated for their energetic work, both in raising funds to help defray expenses of the winners of the Talent Search to the annual meeting and for their work in the Science Open House meetings held at various institutions throughout the State. Detailed reports of these and other committees are available in mimeographed form at the Registration desk, and will be published in the Proceedings .

On recommendation of Council, an effort has been made to streamline the Academy Conference by eliminating the reading of all the committee reports, other than those of the Secretary, Finance, and Research Committee. It is believed that this will shorten the Conference without affecting the operation of the Academy as a whole.

The Academy was represented at two AAAS Council meetings at St. Louis, Missouri, December 26-31, 1952 by your Secretary; and represented at the AAAS Academy Conference by the Secretary and Mrs. Thelma G. Heatwole. Also present at this meeting was Dr. Arthur Bevan, Past-President of the Virginia Academy, and now of the Staff of State Geologist of Illinois. Elected as President for the Academy Conference for 1953 was Wayne Taylor, of Denton, Texas, Chairman of the Texas Science Talent Search, and Secretary of their Junior Academy. Other members of the Virginia Academy present at St. Louis were James W. Cole, of the National Science Foundation, Felix Saunders, Martinsville, Miss Samuella Crim, of New Market, Sidney S. Negus, Richmond, Professor Harry E. Alden, University of Virginia, and others.

The new Chairman of the Membership Committee, Dr. Henry Leidheiser, of the Virginia Institute of Scientific Research, has done an outstanding job as will be noted in his report. Each member of the Academy should be an active member of this committee, and we hope to attain at least twelve hundred members for 1953. Our present active membership is all the more reason that we should have a steady growth each year.

It was recommended by Council that the fiscal year be changed to the calendar year, which will require revision of the Constitution.

It is believed that greater service can be rendered the individual sections of the Academy and to the Virginia Journal of Science by transferring the Academy addressograph plates to a commercial mailing service company. This will make the addressograph files of the Academy more

flexible; more readily available for use by the various sections, and will greatly decrease the work of the Edtior-in-Chief and Secretary, in maintaining an up-to-the-minute file.

FOLEY F. SMITH, *Secretary-Treasurer.*

Richmond, Virginia
April 17, 1953

The Officers and Council Members
Virginia Academy of Science
Richmond, Virginia

Gentlemen:

I have made an examination of the Secretary-Treasurer's books of account and record of

VIRGINIA ACADEMY OF SCIENCE, RICHMOND, VIRGINIA

for the year ended March 31, 1953, and submit herewith my report thereon consisting of the statements listed in the foregoing index.

The Statements of Cash Receipts and Disbursements, Exhibits "B" and "C" reflect the General Fund and Research Fund cash transactions for the year ended March 31, respectively. The cash in bank was verified by direct correspondence with the depositary bank and the balances reported were reconciled with the amounts shown on the Consolidated Fund Balance Sheet, Exhibit "A". The cash receipts of record were traced in total to the record of their deposit in bank, and all recorded disbursements were evidenced by properly signed cancelled checks with the exception of those checks outstanding at the balance sheet date.

The amounts shown on the Consolidated Fund Balance Sheet, Exhibit "A", and Statements of Cash Receipts and Disbursements, Exhibits "D", "E" and "F", relating to Trust Fund Accounts were taken from the March 31, 1953, report of the Trust Agent, First and Merchants National Bank of Richmond and were not verified in any manner beyond the confirmation of cash balances.

Income remitted to your Treasurer by the Trust Agent was traced to record of deposit in the bank.

In my opinion, the accompanying statements present fairly the position of the Virginia Academy of Science at March 31, 1953, and the results of its financial operations for the fiscal year, in confirmtiy with generally accepted accounting principles applied on a basis consistent with that of the preceding year.

Respectfully submitted,

J. WADDELL RISON,
Certified Public Accountant.

VIRGINIA ACADEMY OF SCIENCE
RICHMOND, VIRGINIA
MARCH 31, 1953

EXHIBIT "A"

ASSETS

GENERAL FUND:		
Cash in Bank (Exhibit "B")	$ 2,665.95	
Investments (At Cost):		
Preferred Stocks (Market Value $2,372.00)	2,445.95	
Due from the Virginia Journal of Science	321.75	
Total General Fund		$ 5,433.65
RESEARCH FUND:		
Cash in Bank (Exhibit "C")	$ 2,587.39	
Total Research Fund		2,587.39
TRUST FUND PRINCIPAL ACCOUNT (See Footnote):		
Cash on Deposit (Exhibit "D")	$ 1,169.73	
Investments (At Cost):		
United Savings Bonds Series F & G (Market Value $7,843.70)	$ 7,837.00	
Stock Securities (Market Value $6,329.38)	4,901.41	
5% Real Estate Note (Secured by First Deed of Trust)	1,700.00	14,438.41
Total Trust Fund Principal Account		$15,608.14
TRUST FUND PRINCIPAL ACCOUNT — INVESTMENT INCOME ACCOUNT: (See Footnote)		
Cash on Deposit (Exhibit "E")	$ 115.75	
Total Trust Fund Principal Investment Income Account		$ 115.75
TRUST FUND ACCUMULATED INCOME ACCOUNT (See Footnote):		
Cash on Deposit (Exhibit "F")	$ 16.38	
Investment (At Cost):		
Preferred Stock (Market Value $1,524.00)	1,790.85	
Total Trust Fund Accumulated Income Account		1,807.23
		$25,552.16

EXHIBIT "A" (Continued)

LIABILITIES AND FUND SURPLUS

GENERAL FUND:		
Advance Payment on Dues	$ 11.00	
Fund Balance	5,422.65	
Total General Fund		$ 5,433.65
RESEARCH FUND:		
Fund Balance	$ 2,587.39	
Total Research Fund		$ 2,587.39
TRUST FUND PRINCIPAL ACCOUNT:		
Fund Balance, March 31, 1953	$15,608.14	
Total Trust Fund Principal Account		$15,608.14
TRUST FUND PRINCIPAL ACCOUNT — INVESTMENT ACCOUNT:		
Fund Balance:		
Balance, April 1, 1952	$ 122.00	
Deduct — Excess of Income Distribution and Expense over current year's Income (See Exhibit "E")		6.25
Balance, March 31, 1953	$ 115.75	
Total Trust Fund Principal Investment Income Account		115.75
TRUST FUND ACCUMULATED INCOME ACCOUNT:		
Fund Balance:		
Balance, April 1, 1952	$ 1,807.23	
Add — Dividend Income on Stock	65.52	
	$ 1,872.75	
Deduct — Income Distribution (See Exhibit "F")	$ 49.14	
— Transfer to Trust Fund Principal Account	16.38	65.52
Balance — March 31, 1953	$ 1,807.23	
Total Trust Fund Accumulated Income Account		1,807.23
		$25,552.16

NOTE: Trust Fund Account figures were taken from Trust Agent's report, First and Merchants National Bank of Richmond, and exclusive of cash, were not verified in any manner.

GENERAL FUND

STATEMENT OF CASH RECEIPTS AND DISBURSEMENTS

FOR THE YEAR ENDED MARCH 31, 1953

EXHIBIT "B"

BALANCE ON DEPOSIT — APRIL 1, 1952:			$ 4,660.13
RECEIPT:			
Revenues:			
Dues:			
Regular Members	$ 1,962.00		
Collegiate Members	96.00		
Contributing Members	370.00		
Sustaining Members	210.00		
Life Membership (Paid on Account)	25.00		
Delinquent Dues for Prior Years collected	232.00	$ 2,895.00	
Gifts, Grants and Bequests:			
Virginia Junior Academy of Science		$ 370.00	
Non-Revenue:			
Advance payment of dues	$ 11.00		
Special Contributions toward Annual Meeting May 1953:			
To Science Talent Search	1,525.00		
Collections from sales of booth space for May 1953 meeting	90.00		
Collections from sales of booth space for May 1952 meeting — shown below as deduction of meeting expenses, $330	—		
Dividend form stock investments	13.75	1,639.75	
Total Receipts			4,904.75
			$ 9,564.88
DISBURSEMENTS:			
American Association for Advancement of Science Meeting		$ 200.00	
Junior Academy of Science		439.20	
Annual Meeting Expenses:			
Total Expenses Incurred and			

Paid	$ 411.93		
Proceeds from Meeting Activities	330.00	81.93	
Miscellaneous and General Expenses (Schedule "I")		292.37	
Postage and Express Expense		105.52	
Printing Expense		138.46	
Science Talent Search		1,063.00	
Stationery, Supplies and Stenographic Services		46.50	
The Virginia Journal of Science (Schedule "2")		2,036.00	
Dr. E. C. L. Miller Award		50.00	
Investments in Corporate Stocks		2,445.95	
Total Disbursements			6,898.93
BALANCE — MARCH 31, 1953 (Exhibit "A")			$ 2,665.95

Consisting of:

Cash on Deposit First and Merchants National Bank of Richmond — Checking Account:		
General Fund	$ 1,433.29	
James River Project	45.66	
Science Talent Search	1,187.00	
	$ 2,665.95	

RESEARCH FUND

STATEMENT OF CASH RECEIPTS AND DISBURSEMENTS

FOR THE YEAR ENDED MARCH 31, 1953

EXHIBIT "C"

BALANCE OF DEPOSIT — APRIL 1, 1952:			$ 1,810.62
Receipts:			
Revenues:			
Income from Trust Investments	$ 649.27		
Gift, Grants and Bequests	656.50		
Total Receipts			1,305.77
			$ 3,116.39
DISBURSEMENTS:			
Grants-In-Aid Awards	$ 527.50		
Miscellaneous and General Expenses	1.50		
Total Disbursements			529.00
BALANCE ON DEPOSIT — MARCH 31, 1953 (Exhibit "A")			$ 2,587.39

Consisting of:

Cash on Deposit First and Merchants National Bank of Richmond – Checking Account	$ 2,587.39

TRUST FUND PRINCIPAL ACCOUNT – PRINCIPAL CASH ACCOUNT STATEMENT OF CASH RECEIPTS AND DISBURSEMENTS FOR THE YEAR ENDED MARCH 31, 1953

EXHIBIT "D"

BALANCE – APRIL 1, 1952:		$ 669.73
RECEIPTS:		
Proceeds from Shepperson Deed of Trust Note, Instal'ment paid August 28, 1952		500.00
BALANCE – MARCH 31, 1953 (Exhibit "A")		$ 1,169.73

Consisting of:

Cash on deposit with Depository Bank of the Trust Agent, First and Merchants National Bank of Richmond	$ 1,169.73

TRUST FUND PRINCIPAL ACCOUNT – INVESTMENT INCOME CASH ACCOUNT STATEMENT OF CASH RECEIPTS AND DISBURSEMENTS FOR THE YEAR ENDED MARCH 31, 1953

EXHIBIT "E"

BALANCE -- APRIL 1, 1952:		$ 122.00
RECEIPTS:		
Revenue:		
Dividends on Stock Investments	$ 335.00	
Interest on Federal Government Bonds	195.00	
Interest on Real Estate First Deed of Trust Note	97.50	
Transfer from Trust Fund Accumulated Income Account	16.38	
Total Receipts		643.88
		$ 765.88

DISBURSEMENTS:

Remittance to Virginia Academy of Science — Research Fund	$ 600.13	
Trust Agent's Commission	50.00	
Total Disbursements		650.13
BALANCE — MARCH 31, 1953 (Exhibit "A")		$ 115.75

Consisting of:

Cash on deposit with Depositary Bank of the Trust Agent, First and Merchants National Bank of Richmond	$ 115.75

TRUST FUND ACCUMULATED INCOME — CASH DISCOUNT

STATEMENT OF CASH RECEIPTS AND DISBURSEMENTS

FOR THE YEAR ENDED MARCH 31, 1953

EXHIBIT "F"

BALANCE — APRIL 1 ,1952:		$ 16.38
RECEIPTS:		
Dividends on Stock Investments		65.52
		$ 81.90

DISBURSEMENTS:

Remittances to Virginia Academy of Science — Research Fund	$ 49.14	
Transfer to Trust Fund Principal Account	16.38	
Total Disbursements		65.52
BALANCE — MARCH 31, 1953 (Exhibit "A")		$ 16.38

Consisting of:

Cash on Deposit with Depository Bank of the Trust Agent, First and Merchants National Bank of Richmond	$ 16.38

GENERAL FUND

SCHEDULE OF MISCELLANEOUS AND GENERAL EXPENSES

FOR THE YEAR ENDED MARCH 31, 1953

SCHEDULE "1"

Auditing and Tax Service	$	212.00
Post Office Box Rental		25.00
Virginia Corporation Registration Fee and Franchise Tax		5.00
Fidelity Bond Insurance		12.50
Expenses paid as reimbursement to the office of the Academy's President		14.98
Telephone and Telegraph		16.64
Miscellaneous		6.25
Total (Exhibit "B")	$	292.37

ANALYSIS OF COLLECTIONS FOR AND REMITTANCE TO THE VIRGINIA JOURNAL OF SCIENCE FOR THE YEAR ENDED MARCH 31, 1953

SCHEDULE "2"

BALANCE — APRIL 1, 1953		$ 16.00
COLLECTIONS:		
Membership Dues at $2.00 each:		
749 Paid during current year		1,498.00
66 Delinquent dues collected		132.00
2 Prepaid dues of previous year transferred to current year		4.00
20 Gratuitous subscriptions to Patrons, Honorary and Life Members		40.00
Collegiate Membership Dues at $1.65 each:		
45 Paid during current year		56.25
	(1)	$ 1,714.25
REMITTANCES:		
April 15, 1952		$ 138.00
June 27, 1952		6.25
July 30, 1952		56.00
September 12, 1952		20.75
March 3, 1953		1,752.50
March 11, 1953		24.25
March 20, 1953		27.50
March 25, 1953		10.75
Total Remittances (Exhibit "B")	(2)	$ 2,036.00
BALANCE — MARCH 31, 1953 (1) minus (2) (Overpayment)		$ 321.75

REPORT OF THE LONG RANGE PLANNING COMMITTEE

No new projects were initiated by the Committee during the past Academy year; hence, this is a report on the projects currently being developed.

The Committee on Science Teaching in the Secondary Schools of Virginia completed its studies and requested to be discharged. The members of the Committee, however, agreed to the suggestions that it be continued on inactive status for another year. In the January issue of the *Journal*, the Chairman, Dr. Francis G. Lankford, Jr., published a report

on the preliminary findings of the Committee. His final report is included below.

This committee has completed a superior study of a complex subject and appreciation is herewith expressed; special commendation should be given to the Chairman, and to Professor Percy Warren, Mr. John B. Chase, and Mr. Philip Peterson for their detailed investigations.

Dr. John T. Baldwin, chairman of the *Committee on the Dismal Swamp Project* has presented the following statement concerning the status of the book being written about the Swamp:

"Considerable progress has been made on the *Dismal Swamp Project* during the past year. Eleven collaborators were selected to write a popular book on the Swamp. Various of them have paid one or more visits to the area for collecting and study purposes. Two of them have submitted their manuscripts to the editor; others are known to be actively at work on their segments of the proposed book."

A brief meeting of the *Long Range Planning Committee* was held on May 7 at Virginia Military Institute.

MARCELLUS H. STOW

REPORT OF THE RESEARCH COMMITTEE

The 1953 J. Shelton Horsley Research Award was won by Mr. Stephan Berko and Dr. Frank L. Hereford, Department of Physics, University of Virginia, for their excellent joint paper "Deflection of High Energy Electrons in Magnetized Iron."

During the year several requests for Research Grants-in-Aid were approved. Including two actually approved at the 1952 Annual Meeting, four grants were made for studies connected with the Dismal Swamp Project. In each of these four cases the Committee approved the award of funds, up to the requested amounts, for travel and field expenses through June 30, 1953 (and through August 31, 1953 in Dr. Stow's case), payable upon the submission of expense accounts to the Secretary of the Academy. Persons extended these grants, with their planned study, the requested grant, and (in parentheses) the amount spent at the time of this report follow:

1. J. T. Baldwin, Jr., College of William and Mary. Field expenses to study the plants and vegetation of the Dismal Swamp. $200.00 ($200.-00).

2. J. J. Murray, Lexington. Field expenses to study the birds of the Dismal Swamp. $100.00 ($57.50).

3. Marcellus Stow, Washington and Lee University. Field expenses to study the geology of the Dismal Swamp. $170.00 ($100.00).

4. C. O. Handley, Jr. Field expenses to make a survey of mammals of the Dismal Swamp. $100.00 ($).

Three other Grants-in-Aid were awarded during the year. These were to:

5. K. E. Hyland, Jr., Christchurch School. Expenses, supplies, and equipment to study the life cycle and parasitic habits of the chigger mites found on amphibians. $120.00.

6. Frank R. Burleson, Virginia Polytechnic Institute. Grant to be used toward purchase of a Beckman pH meter to be used in study of algal flora of soils. $150.00.

7. John B. Burch, University of Richmond. Field expenses in connection with a study of freshwater Mollusca of Hanover, Henrico, and Chesterfield Counties.

WALTER S. FLORY, JR.

REPORT OF

THE COMMITTEE ON FINANCE AND ENDOWMENT

The Committee on Finance and Endowment met on April 29 and carefully considered the finances of the Virginia Academy of Science. The audit, which had been studied by each member of the Finance Committee, was approved.

After going over the expenses for the past year, the Committee proposed the following budget for the coming year:

BUDGET

VIRGINIA ACADEMY OF SCIENCE

	Budget for 1952-53	Spent in 1952-53	Proposed for 1953-54
A. A. A. S. Meeting	$125.00	$125.00	$125.00
E. C. L. Miller Award	50.00	50.00	50.00
Junior Academy of Science and Science Talent Search	225.00	225.00	225.00
Meeting expenses	25.00	----	25.00
Audit and tax services	170.00	212.00	200.00
Premium and treasury bond	12.50	12.50	12.50
Stationery supplies and stenographic services	125.00	46.00	75.00
Postage and express charges	75.00	105.00	125.00
Travel expenses for representatives to meetings	250.00	75.00	200.00
Subscriptions to Journal of Science for life members	40.00	40.00	46.00
Addressograph service	----	----	75.00
	$1197.50	$890.50	$1158.50

It is recommended by the committee that the Research Fund be turned over to an agency account at the First and Merchants National Bank in Richmond. It is our suggestion that $500.00 be kept available at all times for immediate use for grants and other requisitions and that the remaining money, some of which is now lying idle, be invested in stocks as recommended by the Trust Department of that bank. It is felt that in so doing a better income would be derived for the use of the Research Committee, and that this arrangement will markedly reduce the audit expenses of the Academy as it will leave only the general fund to be audited.

The Committee also considered some new method of financing the Junior Academy of Science and the Science Talent Search. It is hoped within the next year a more reasonable arrangement, possibly through an endowment fund, will be worked out to finance these two very important activities.

GUY W. HORSLEY

REPORT OF THE COMMITTEE ON THE VIRGINIA JUNIOR ACADEMY OF SCIENCE

The Virginia Junior Academy of Science, in keeping with its purpose of promoting and maintaining interest in science among secondary school students, has carried out the following activities during 1952-53:

PUBLICITY

1. The *Junior Science Bulletin*, a four-page publication, was initiated. The publication was made possible by a contribution of $200 by the American Tobacco Research Laboratory. The printing has been done by the Newport News High School print shop under the supervision of Miss Susie V. Floyd and the Newport News Science Club. Three issues, (approximately 1600 copies per issue) have been mailed to science teachers, committee members, to Council members, and to firms that have given their financial support to the work done with the Juniors.
2. One issue of the *Virginia Journal of Education* was largely devoted to special articles, notices, and photographs concerning the work of the V. J. A. S.
   One issue of the *Virginia Education Bulletin* was entirely devoted to Science and Mathematics and contained special notices concerning the V. J. A. S.
3. Announcements concerning V. A. S. work and the Speakers and Counsellors Bureau were made at the Science Teachers' Section meeting of the Virginia Educational Association, at each District meeting of the V. E. A., and at the annual meeting of the Virginia Teachers' Association.

4. Direct correspondence with active clubs amounted to 538 letters and four sets of mimeographed communications.

SOLICITATION OF WORKING FUNDS

1. Funds were solicited from industrial firms to defray the expenses of the work sponsored by the Virginia Academy of Science among secondary school students. A total of $1485 was raised for this purpose from the following 19 firms:

Allied Chemical and Dye Corporation
American Cyanamid Company
American Tobacco Research Laboratory
American Viscose Corporation
The Chesapeake Corporation of Virginia
E. I. duPont de Nemours and Company, Inc.
Mrs. Jessie Ball duPont
Experiment, Incorporated
Fisher Scientific Company
The Lane Foundation
Monsanto Chemical Company
Newport News Shipbuilding and Dry Dock Company
Phipps and Bird
Reynolds Metals Company
West Virginia Pulp and Paper Company
Hastings Instrument Company
Virginia Power and Electric Company
Chesapeake and Potomac Telephone Company of Virginia
Union Carbide and Carbon Corporation

TEACHER — SPONSOR SCHOLARSHIPS

1. Summer scholarships made available by the University of Virginia and the College of William and Mary as awards to two outstanding Teacher-Sponsors were increased from $100 to $200.

AFFILIATION OF CLUBS AND INDIVIDUAL MEMBERSHIP

1. Charters and membership cards were issued to sixty-five clubs with an individual membership of approximately 1200. Fifty-four of the clubs were new affiliates.

SCIENCE REGIONAL OPEN HOUSES

The Committee asked five colleges to sponsor Open Houses. Emphasis was to be placed on greater uniformity in competition, on exhibits, lectures, tours, etc. These schools did an excellent job. A total of 118 student exhibits were on display; 49 individual and 4 club exhibits were qualified for entry at the May meeting of the V. J. A. S.

PROGRAM FOR MAY MEETING

1. Exhibits were left on display longer to allow a better length of time for judging.
2. Five students were selected to explain and demonstrate their projects before the Junior Assembly.
3. The General Electric "House of Magic" show was scheduled for appearance.
4. A guest speaker, Dr. John Fisher, Metallurgy Research Department, General Electric Company, spoke on "CRYSTAL GROWTH".

AWARDS

E. C. L. Miller Award: Honors were given equally to Newport News Science Club, Miss Susie V. Floyd, Sponsor, and to Buckingham Central Science Club, Mr. O. P. Sadler, Sponsor.

First Place – Club Exhibit: Newport News Science Club, Miss Floyd, Sponsor.

Second Place – Club Exhibit: Madison Heights Science Club, Mrs. Kate McDermott, Sponsor.

Third Place – Club Exhibit: Lane Science Club, Miss Martha Duke, Sponsor.

First Place – Individual Exhibit: Jane Black, James Monroe H. S., Fredericksburg.

"Four Inert Minerals From the Potomac Region"

Second Place – Individual Exhibit: Doris Hermes, Martinsville H. S., Martinsville.

"Dyeing of Orlon"

Third Place – Individual Exhibit: Eleanor O'Meara, Lane H. S., Charlottesville.

"Colors Caused by the Polarization of Light"

Honorable Mentions – Individual Exhibits:

Patricia Ann Smith, Radford H. S., Radford
Floyd Wilson, Booker T. Washington H. S., Norfolk
Glenn Shepherd, Warwick H. S., Warwick
Frank Daniel, Lane H. S., Charlottesville
Merle Mitchell, Booker T. Washington H. S., Norfolk

Honorary Student Memberships:

A. A. A. S.: Rosser Rudolph, Washington-Lee H. S., Arlington
Merle Mitchell, Booker T. Washington H. S., Norfolk

V. A. S.: Claude Barfield, Newport News H. S., Newport News
James Hayes, Booker T. Washington H. S., Norfolk

Teacher — Sponsor Scholarships:

College of William and Mary — L. W. Jarman, Thomas Jefferson H. S., Richmond

Alternate — O. P. Sadler, Buckingham Central H. S., Buckingham

University of Virginia — Miss Martha Duke, Lane H. S., Charlottesville

Alternate — Miss Delores Hoback, Martinsville H. S., Martinsville

REPORT OF
THE EIGHTH VIRGINIA SCIENCE TALENT SEARCH

The following is a summary of the Eighth Virginia Science Talent Search, an affiliate of the Twelfth National Search:

547 seniors from 64 secondary schools requested examination papers (a tie with the previous record).

143 completed all papers and thus became official contestants in the Search (a new record).

One of these was named National Winner, and seven won National Honorable Mention. (Names given below.)

Forty-nine of the 143 were chosen as Virginia finalists on the basis of their written records, *i. e.*: (1) science aptitude examinations; (2) high school scholastic record; (3) teacher's analysis and recommendations; (4) science project and project report. All finalists and sponsors were invited to the annual meeting of the Academy. Most attended, and part of their expenses were paid from the funds mentioned in the Virginia Junior Academy Committee report.

At the meeting, finalists were interviewed by panels of judges. The results of these interviews were combined with the written records to select eighteen Winners, the other thirty-one automatically becoming Honorable Mentions.

WINNERS

** National Winner
* National Honorable Mention

* Margaret S. Anderson	Norview H. S.	Norfolk
Claude E. Barfield	Newport News H. S.	Newport News
* Harvey J. Charlton	Buckingham Central	Buckingham
* Paul C. Desper	Wilson Memorial H. S.	Fishersville
Courtney S. Jones	Hampton	Hampton
Robley J. Light	William Fleming	Roanoke
Paul D. Lindsey	John Marshall	Richmond
Sylvia D. Mathis	Stuart Hall	Staunton
Raphael C. Myers	Norview	Norfolk
William K. Nelson	John Marshall	Richmond

William M. Pardue	Blacksburg	Blacksburg
William E. Parsons	Jefferson Senior	Roanoke
William E. Shawcross	Granby	Norfolk
Henry M. Snell	Thomas Jefferson	Richmond
Virginia L. Stauss	Mount Vernon	Alexandria
Freddie Ray Stone	Wilson Memorial	Fishersville
Helen B. Stone	Thomas Jefferson	Richmond
George Marvin Tatum, Jr.	Thomas Jefferson	Richmond
Thomas G. Teates	Warren County	Front Royal
Suzanne Tully	Thomas Jefferson	Richmond
Gail P. Williams	Hampton	Hampton
William F. Willoughby	Christchurch	Christchurch
* James A. Hayes	B. T. Washington	Norfolk
Jerry B. Hibbitts	Dickenson	Clintwood
James M. Howell	Radford	Radford
Francis Hull	Newport News	Newport News
* F. Wendell Johnson	Hermitage	Richmond
Kenneth T. Lassiter	Hermitage	Richmond
** Merle A. Mitchell	B. T. Washington	Norfolk
* Kenneth A. O'Beirne	Andrew Lewis	Salem
* Rosser A. Rudolph	Washington-Lee	Arlington
Francis W. Sheild	Hampton	Hampton
Louis W. Spradlin	Andrew Lewis	Salem
Thomas A. Stansell	Hermitage	Richmond
John L. Tiller, Jr.	John Marshall	Richmond
Walter V. Weyhmann	Jefferson Senior	Roanoke

HONORABLE MENTION

John C. Alderman, Jr.	Lane	Charlottesville
John M. Austin	Buckingham Central	Buckingham
Edward A. Brewton	Granby	Norfolk
Edwin T. Chapman	Newport News	Newport News
Epsey M. Cooke	Stuart Hall	Staunton
Colleen G. Cord	Radford	Radford
E. Donald Crewdson	Warren County	Front Royal
Frank D. Daniel, Jr.	Lane	Charlottesville
Charles W. Dyke	Hermitage	Richmond
James A. Eller	Norfolk Catholic	Norfolk
Jonathan T. Howe	Granby	Norfolk
Thomas W. Imel	Hermitage	Richmond
William H. Jago	William Fleming	Roanoke

The Chairman is happy to have this opportunity to make several grateful acknowledgments:

To the Leander McCormick Observatory of the University of Virginia for clerical assistance;

To the presidents and officers of Virginia colleges and universities for their interest in revising the list of scholarships offered;

To the officers of the Academy for much sound advice and encouragement;

To the members of the Committee and to the judges for their cheerful cooperation.

EDWARD R. DYER, JR.

REPORT OF
THE COMMITTEE ON ACTIVITIES FOR COLLEGIATE MEMBERS

This year's committee met with the same lack of response reported by its 1951-1952 predecessor. Early in the college year the chairman sent letters to seventeen Academy members at institutions scattered around the State. These letters suggested ways of trying to develop among college students an interest in Academy affairs, including attendance at and participation in the May meetings. The response was disappointing. We received only four replies, three written and one verbal, none of which was encouraging. Two stated that they found only an apathetic attitude among the students. Graduate students seemed to appreciate the value of Academy work, but with few exceptions, according to these correspondents, their undergraduates seemed satisfied to do the minimum work required to get by, and were too busy with their own fraternity and other extracurricular activities to bother with anything more serious. Apparently having his science club listed as affiliated with the Virginia Academy of Science does not seem to the average student to carry with it any particular advantage.

The interested high school student is served by the Junior Academy. The graduate students fall more naturally into the senior Academy and do not need the encouragement of this committee. With the students between high school and graduate school we must again report failure. If this committee is to continue to exist, perhaps it should be smaller and made up of men who have the time to travel around the State visiting the science clubs in our colleges and talking directly to the students. Perhaps also the purpose of the committee should be reviewed in Council or by the President's Advisory Committee in order to determine its function and to give it specific assignments other than to secure affiliation of science clubs as student chapters in the Academy.

W. SCHUYLER MILLER AND ROBERT P. CARROLL

REPORT OF THE COMMITTEE ON MEMBERSHIP

During the past year, from May 1, 1952, to May 1, 1953, the Academy has added 151 new members classified as follows:

Regular and contributing members	109
Student members	42
Total	151

The total membership of the Academy in good standing as of May 1, 1953, is as follows:

Regular, contributing, and sustaining	910
Student	63
Total	973

The low figure of 973 members as compared with membership of 1204 in 1949-1950 and 1194 in 1950-1951 is explained largely by the fact that all members in arrears according to the terms of the new constitution have been dropped from the rolls.

It is the Committee's feeling that since the Academy often speaks for science in Virginia, a larger membership is necessary and desirable. It is felt that a total membership goal in the neighborhood of 1500 active members should be set for the next two-year period. The past accomplishments and future aims and objectives should be brought forcefully to the attention of non-members interested in science in Virginia.

HENRY LEIDHEISER, JR.

REPORT OF THE JAMES RIVER PROJECT COMMITTEE

The report of the Committee for the year 1952-53 consists of a financial statement concerning sale of the monograph on "The James River Basin – Past, Present and Future."

Summary as of April 30, 1953

Total copies distributed as of April 30, 1952	484	
Balance on deposit, Peoples National Bank, Lexington, Va. as of April 30, 1952		1531.90
Complimentary copies distributed between May 1, 1952 and April 30, 1953	10	
Sold, payment received at $6.00 between May 1, 1952 and April 30, 1953	16	96.00
Sold, payment due, between May 1, 1952 and April 30, 1953	1	6.00

Total distributed between May 1, 1952 and April 30, 1953	27
Total cash received between May 1, 1952 and April 30, 1953	96.00
Deposited in bank between May 1, 1952 and April 30, 1953	126.00
Expenditures charged to Monograph account between May 1, 1952 and April 30, 1953	0.00
Net balance in Peoples National Bank from sales May 1, 1952 to April 30, 1953	126.00
Total balance in Peoples National Bank from sales May 11, 1950 *to April* 30, 1953	1657.00
Total copies distributed May 11, 1950 *to April* 30, 1953	511

MARCELLUS H. STOW

REPORT OF THE COMMITTEE ON RESOURCE-USE EDUCATION

The Resource-Use Education Committee had an active year.

The Committee felt that if resource-use education was to find its rightful place in Virginia, past recommendations to the Academy should be brought before the State Board of Education. Through the support of President Lloyd C. Bird and other academy members and the cooperation of Dr. Dowell Howard, State Superintendent of Public Instruction, such a meeting was arranged on February 26. The subject of conservation education in Virginia schools and colleges was discussed and the following recommendations made:

1. *Coordination of Resource-Use Education at State Level and Inter-Agency Cooperation*:

   The Committee recommends the appointment of a *well-trained, full-time* supervisor of conservation education studies in the office of the State Board of Education to coordinate and advance all resource education effort at the state level.

2. *Teacher training*:

   a) Require all state-supported teacher training institutions to offer an accredited conservation course to prospective Virginia teachers. Require one full conservation course of all teachers before certification.

   b) Have the supervisor of conservation education studies initiate a *pre-service* teacher training program with emphasis on the conservation content of such courses as general science, biology, chemistry, physics, geology, sociology, economics, geography, and history. All resource-use agencies should be asked to help.

c) Have the same supervisor initiate a broad program of *in-service* teacher training making use of workshops and other proven teaching media, to show how conservation can be woven into existing courses of instruction.

3. *Teaching Materials*:
The Committee recommends that greater stress be given to the prepation and augmentation of teaching materials on resource conservation. Some material would be aimed at teachers, some at the grades. In the preparation of this material, inter-agency help, advice, and review should be asked for. Adequate material is lacking now.

4. *Resource-use Instruction in Elementary and Secondary Schools*:
The Committee urges that greater emphasis be placed on conservation in all grades; that existing curricula be revised and brought up to date, and that more resource-use fundamentals be integrated in all course work.

The Committee undertook the responsibility of sponsoring a Resource-Use Education symposium at the annual meeting in Lexington, May 8. It was endorsed by the president and supported by many of the sections. Alfred E. Wingo of the State Board of Education was named moderator; twelve experts representing various resource agencies and educational institutions were asked to serve on the panel.

J. J. SHOMON

REPORT OF THE COMMITTEE ON VIRGINIA FLORA

Th individuals of the committee have been variously active in relation to the state flora. Dr. Patterson continues his studies of the mosses. Miss Artz continues her investigations of the Massanutten region. Mr. Mason has continued his photography and has given a number of illustrated lectures relative to the kinds of native plants and their wise use, in an effort to teach the conservation of useful and infrequent species.

Mr. H. A. Allard of Arlington, now a retired plant physiologist of the United States Department of Agriculture, is making a detailed study of the flora of the Triassic area in Northern Virginia. Mr. E. C. Leonard, of the United States National Herbarium, is cooperating with him. Remembering their contributions to the state flora in their studies of Bull Run Mountain in Fauquier and Prince William counties, we can anticipate an important contribution from them relative to the Triassic area. Not only should this be of floristic value but should also have an ecological bearing.

Mr. Massey, with the cooperation of members of the committee and others, has been active in developing an annotated check list of the plants of the State. A preliminary check list covering 26 families was reported last year. The check list is to be further developed and carried to completion. There being considerable interest in the native orchids, a compete check list has been prepared for this one family. This list will be

printed in the near future. These lists report occurrences in the State by physiographic provinces and counties. A paper on the aquatic and semi-aquatic plants in Virginia is nearing completion. This paper will include habitat, distribution, and economic importance of the plants included. Two papers have been published by Massey in *Virginia Wildlife*: "Native Plants and Their Wise Use" appeared in the May 1952 issue; and "Evergreens Native in Virginia," in the December 1952 issue.

A. B. MASSEY

REPORT OF THE SPEAKERS AND COUNSELLORS COMMITTEE

The Speakers and Counsellors Committee, during the year, prepared a list of speakers for each section of Virginia. Regional chairmen were selected so that the arranging for speakers could be arranged locally. The list of speakers and an outline of the committee's program was put into the hands of every principal and school superintendent in Virginia through the cooperation of D. J. Howard, Superintendent of Public Instruction and R. E. Reid, Assistant Superintendent of Public Instruction. Through the cooperation of Mrs. B. J. Heatwole, Chairman of the Junior Academy of Science, the program was called to the attention of all science teachers in Virginia. Mr. A. L. Wingo, a member of the committee and Supervisor of Research, State Board of Education, met with both the white and colored high school principals of the State and called the services of the Speakers and Counsellors Committee to their attention.

In the area serviced by Dean Warren and where Mrs. Heatwole could extend a helping hand, the response was gratifying. In other areas, the response was less than an average of two speakers per district serviced by the various regional chairmen.

It is the suggestion of the committee that the committee be continued for one year to answer any requests resulting from the publicity given this year and then be discontinued.

S. S. OBENSHAIN

REPORT OF THE RESOLUTIONS COMMITTEE

BE IT RESOLVED, that the Virginia Academy of Science record its sincere appreciation to the host for the thirty-first annual meeting, the Virginia Military Institute, and its Superintendent, General William H. Milton.

BE IT FURTHER RESOLVED, that the Virginia Academy of Science express its heartfelt thanks and commendation to the Local Committee on Arrangements under the able leadership of Colonel S. M. Heflin, for making possible a most successful meeting.

BE IT FURTHER RESOLVED, that the Academy express its deep regret at the temporary absence from the State of our Secretary Emeritus,

Dr. E. C. L. Miller, who has been present at all former meetings of the Academy since its formation in 1923.

E. S. HARLOW, for
RUSKIN FREER, *Chairman*, and
DEAN IVEY LEWIS

REPORT OF THE COMMITTEE ON PLACE OF MEETING FOR 1954

This committee is pleased to report that Mr. Colgate Darden, president of the University of Virginia, has extended to the Academy a cordial invitation to hold its annual meeting for 1954 at the University of Virginia, Charlottesville. It is our recommendation that the Academy accept this invitation.

I. G. FOSTER

REPORT OF THE COMMITTEE ON LOCAL ARRANGEMENTS

The Committee on Local Arrangements for the thirty-first annual meeting of the Virginia Academy of Science was drawn from the faculty of the host instittuion – the Virginia Military Institute. The meeting was held on May 6, 7, 8, and 9, 1953.

The officers and Council of the Academy met with the Local Committee on October 12, 1952; and it was decided to abolish the annual banquets for both the Junior Academy and the Senior Academy and to have the General Electric Company bring its "House of Magic" Show to the Junior Academy meeting on Thursday, May 7, at 8:30 P.M. and have Dr. Hubert N. Alyea of Princeton University give his famous lecture on Atomic Energy on Friday, May 8, at 8:30 P.M. This was done; and Dr. John C. Fisher of the Metallurgy Department of the General Electric Company addressed the Junior Academy on Friday, May 8, at 11:30 A.M.

Meeting rooms were equipped and assigned to the twelve Academy sections, one section in Maury-Brooke Hall, one section in Nichols Engineering Hall, and ten sections in Mallory Hall. Due to the size of these rooms, all sections had ample space, and they were not crowded. The record shows that 494 senior members registered and that 144 junior members registered during the meeting.

There were 45 Junior Academy exhibits, and they were housed in three large adjoining laboratories in Mallory Hall. There were eight commercial exhibits and four educational exhibits. They were housed in two large adjoining laboratories in Mallory Hall. The commercial exhibits consisted of the following: A. S. Aloe Company, Carolina Biological Supply Company, American Tobacco Company, Fisher Scientific Company, Phipps and Bird, Cardinal Products Company, Bausch and Lomb Optical Company, and the American Optical Company. The educational exhibitors were Langley Field, Blue Ridge Parkway, Newport News Shipbuilding and Dry Dock Company, and Professor Lowell Heisey of Bridge-

water College. The income from the meeting was much more than sufficient to meet the expenses of the annual meeting of the Academy, and the balance will accrue to the Academy.

The Superintendent and Mrs. Milton held a Reception for the Academy members and guests at Alumni Hall on Friday afternoon from 4:30 P.M. to 6:00 P.M., during which time some three hundred guests were in attendance. A committee of faculty ladies met the visiting ladies and arranged a sightseeing tour during Friday morning, May 8.

The Committee wishes to express its appreciation for the fine cooperation of the section officers before and during the meeting. The Chairman gratefully acknowledges the valuable assistance given him by the Academy officers and sincerely thanks all of the Committee members for their continuous help.

S. M. HEFLIN

A REPORT OF THE COMMITTEE ON SCIENCE TEACHING IN VIRGINIA SCHOOLS

A Committee on Science Teaching in Virginia Schools was created by the Academy late in 1951. Members of the Committee consist of:

Dr. F. G. Lankford, Jr., (Chairman), Department of Education University of Virginia

Dr. Byron M. Cooper, Department of Geology, Virginia Polytechnic Institute

Dr. George Jeffers, Head of the Biology Department of Longwood College

Mr. John B. Chase, Jr., Department of Education, University of Virginia

Dr. James W. Cole, Department of Chemistry, University of Virginia

Dr. Percy H. Warren, Madison College

Dr. William M. Hinton, Professor of Psychology, Washington and Lee University

Mr. F. D. Kizer, Science Faculty of Norview High School

Dr. R. O. Nelson, Superintendent of Schools, Albemarle County, Charlottesville

Three studies have been done for the Committee. One of these was undertaken by Professor Percy Warren of Madison College. It deals with assignments of science teachers, preparation of science teachers, and their reactions to their college preparation. Among Professor Warren's preliminary findings are these:

"It was found that more than 50% of the high schools in Virginia have a minimum science offering of general science, biology and chemistry. Notwithstanding this fact, more than 50% of the teachers who taught one or more classes in science taught only one or two science classes.

More than 60 taught only one science subject and more than 85% of the teachers taught no more than two different subjects in science."

He has collected through questionnaires a great deal of original data which he is now in the process of organizing into a final report. He hopes to be able to complete this study before the end of 1953. He is interested in obtaining further information on teaching personnel through the preliminary annual reports that will be filed with the State Department of Education by high school principals in the fall of 1953.

Mr. John B. Chase has completed his study for the committee on Certification of Science Teachers. His study describes practices in Virginia as well as in other states. It also obtained from Virginia superintendents a description of their practices in employing science teachers and their opinion regarding certification. His report also includes a review of similar studies conducted elsewhere as well as the recommendations of various national committees. He reached the following 11 conclusions:

1. In general, writers feel that state certification requirements are not sufficient to assure competence in subject matter.
2. In general, state requirements for certification do not require the breadth of training that seems to be desirable. A breadth of training was recommended by superintendents of Virginia.
3. State certification requirements should encourage and require training which provides functional, integrated general science courses for the science teacher drawing from chemistry, physics, biology, astronomy, geology and meterology.
4. State certification requirements should require the prospective science teacher to have introductory courses in at least three major fields of science – biology, chemistry and physics.
5. State certification requirements should require the prospective teacher to have additional courses in biology, chemistry, and physics totaling at least 24 hours in at least one field and at least 18 semester hours in others.
6. Science teacher should be trained and certified to teach at least 3 high school sciences.
7. In Virginia, the vast majority (98.2 percent) of possible science vacancies calls for certification in at least three of the sciences.
8. In Virginia, it seems more desirable for teachers to be trained and certified to teach any of the possible combinations of fields rather than one specific science.
9. A plan for a single endorsement rather than the present plan of separate endorsement was favored and recommended by 55.3 percent of the superintendents reporting.
10. Science teachers should be trained and certified so as to enable them to integrate the various sciences and to show social, economic, and political relationships which exist in scientific development and

progress. This cannot be accomplished by a series of separate courses alone and calls for further study of the organization and methodology used in science courses on the college level.

11. There should exist a constant and closer working relationship between certification agencies and institutions planning programs the training of teacher of science. Such a task requires the best cooperative effort of all concerned – schools of education, departments of science, scientific organizations and state agencies.

Mr. Philip Peterson has made available to the committee the findings of his Master's thesis completed in 1952 at the University of Virginia. He studied science offerings and student election of science courses in Virginia high schools. Regarding offerings of the Virginia high schools, Mr. Peterson found that predominantly the offerings are in general science, chemistry, biology, and physics.

Courses in general science have been commonly established at the seventh, eighth, and ninth grade levels, and pupil enrollment in these courses were generally restricted to these grade levels. Biology enrollments came principally from the tenth grade, although some ninth grade and eleventh grade pupils enrolled in the course. Physics and chemistry enrollments were predominantly from the eleventh and twelfth grades, where these two courses have been commonly offered.

Using a sample of Virginia high schools, Mr. Peterson found that the most frequent combination of science courses elected by Virginia high school students while in high school is one including a course or courses in general science and a course in biology. The second most frequent combination was a course or courses in general science together with biology or chemistry.

Mr. Peterson also examined the enrollments in science courses in a sample of Virginia accredited high school for the single year of 1950-51. He found that in 1950-51 general science was the most widely elected science course in high school. The total enrollment in this subject was 13,068 pupils, or 35.8 percent of the total sample school enrollment. Biology was the next most widely elected science with an enrollment of 6,050 pupils or 16.6 percent of the total school enrollment. Chemistry was third in number of enrollments, with 2,069 pupils electing the subject, or 5.7 percent of the total sample school enrollment. Few students elected physics. Only 569 pupils, or 1.6 percent of the total sample school enrollment, elected that science.

In every science course two or three textbooks were used predominantly. The science textbooks most often used by pupils in general science classes were the Wood and Carpenter *Our Environment* series; Smallwood, *et al.*, *New Biology* by pupils taking biology; Jaffe, *New World of Chemistry* by students taking chemistry; Fuller, *et al.*, *First Principles of Physics* by pupils taking physics.

Recommendations of the Committee

1. Our committee recommends that the Academy continue such a committee (not necessarily the same personnel) until Professor Warren's study is completed and a final report can be made.
2. Our committee recommends that the President of the Virginia Academy of Science and Chairman of Long Range Planning Committee approach Superintendent of Public Instruction Dowell Howard to ask him to obtain further data on science teaching personnel which Professor Warren needs in the completion of his study.
3. The committee recommends that Mr. Chase submit to the *Virginia Journal of Science* a paper dealing with his study on Certification of Science Teachers.
4. The committee suggests that the Virginia Academy of Science undertake to get before the State Board of Education some constructive proposals for improving the certification of science teachers in Virginia.

F. G. LANKFORD, JR.

REPORT OF THE VIRGINIA INSTITUTE FOR SCIENTIFIC RESEARCH

The Research Institute is in its fourth year, and although much remains to be done, it is believed that high quality research is now being carried out on important problems with first-class equipment. All of the major items of equipment, for which special funds were raised during the past two years, have been purchased and installed. They consist of an X-ray diffraction unit, an ultracentrifuge, and an electron microscope with an electron diffraction attachment. These instruments greatly increase the range and accuracy of studies which can be carried out at the Institute.

The research studies can be classified in three main groups: the surface chemistry of metals, including catalysis, corrosion, and electrochemical properties; the preparation of large metal crystals of special shapes and orientations; and the determination of molecular weights with the aid of the centrifuge. Under the heading of surface chemistry the study of the mechanism of hydrocarbon synthesis (manufacture of artificial gasoline) is being continued for a large oil company. Another project, on the influence of crystal face on the corrosion of metals, is being carried out for another sponsor. A study of the electrochemical properties of the wonder metal, titanium, is being made for a government agency with a view to finding a method of electroplating this increasingly important material. The X-ray unit is used for determining the structure and orientation of the surface crystals, and the electron microscope, with a magnifying power of 100,000, is used to examine the surface changes during these processes. The prepartion of large metal crystals for other research laboratories has greatly increased in scope and complexity during the past year, and the Institute has more orders for crystals than it can

conveniently take care of. Studies with the ultracentrifuge during the past year have consisted largely of determining the molecular weights and sizes of large protein molecules obtained from a farm product and used in the manufacture of synthetic textiles. Preliminary studies were carried out on the molecular weights of some of the components of tobacco. Studies will soon be started on the cholesterol content of blood in relation to hardening of the arteries in humans. Several miscellaneous studies which do not come under the above headings have been made. One of these is concerned with the influence of crystal face on the photographic properties of silver chloride and is being conducted for the Air Force.

The operating income for the year of 1952, including $28,000.00 raised for the purchase of special equipment, was $90,311.19. There are sixteen people employed at the Institute, some of them working part time. With the increasing business of the Institute the administrative duties have greatly increased, and Mr. Robert Kean, the secretary, and Mr. Henry Leidheiser, the laboratory manager, have done a fine job in keeping the business in order. The research staff has also discharged its duties with distinction.

ALLAN T. GWATHMEY

REPORT OF THE VIRGINIA JOURNAL OF SCIENCE

The Journal had a very successful year, as the attached financial statement will show. We were able to get a favorable two-year contract with the Giles County Virginian. Mr. M. D. Coe, editor of the Giles County Virginian, is taking a personal interest in the Journal, and all indications point to a better Journal in the next few years.

We have been very fortunate in getting lead articles from some of the nation's foremost scientists. Dr. Arthur Bevan, Illinois State Geological Survey, prepared the feature article for the Section of Geology; Dr. Ernest Hauser, Massachusetts Institute of Technology, prepared the featur article for the Section of Chemistry; and Dr. M. J. Zucrow, Purdue University, prepared the feature article for the Section of Engineering.

The Section of Engineering, the Section of Geology, and the Section of Medical Sciences elected new section editors this year, to serve for five-year terms.

BOYD HARSHBARGER

AUDIT OF THE JOURNAL

Dr. Boyd Harshbarger, Editor
Virginial Journal of Science
Blacksburg, Virginia

Dear Dr. Harshbarger:

I am enclosing a copy of the audit report covering the audit which I made of the books of the Virginia Journal of Science.

This audit consisted of a careful check of income and expenditures, bank account (including both checking and savings accounts), advertising account, extra page and reprint accounts.

I found all records to be accurately and satisfactorily maintained and all moneys accounted for.

The enclosed audit statement, which shows a balance of $3,160.57, includes only the money carried in the checking account at the Farmers and Merchants National Bank, and does not include your savings account, which amounts to $1,531.44, also at the Farmers and Merchants National Bank. You have in all some $737.11 in accounts payable, the bulk of this being owed to the Giles County Virginian for printing your January and April Journals. This, of course, will reduce the balance you have on hand by this amount.

I would suggest that again this year some of the balance carried in your checking account be transferred to your savings account, for your operation seems to be such that you will maintain a good working balance in your checking account even if part of the present balance is withdrawn and transferred to savings.

Sincerely,

JOE W. GUTHRIDGE, *Auditor*

VIRGINIA POLYTECHNIC INSTITUTE

STUDENT ACTIVITIES OFFICE

OPERATION STATEMENT FOR THE FISCAL YEAR

Virginia Journal of Science

May 8, 1952 to April 10, 1953

Receipts: *Kind of Receipts*	*Total for the Year*
Academy Subsidy	
Regular members 918 at $2.00	$1,836.00
Student members 58 at $1.25	72.50
Advertising	418.97
Subscriptions	334.44

Extra pages	203.62
Miscellaneous	13.12
Reprints	35.00
TOTAL OF ALL RECEIPTS	$2,913.65

Expenditures: Kinds of Expenditures	*Total for the Year*
Reprints	$ 51.22
Printing	933.76
Postage	83.37
Office Supplies	1.50
Miscellaneous	1.97
TOTAL OF ALL EXPENDITURES	$1,071.72
NET AMOUNT	$1,841.93

STATEMENT OF CASH ACCOUNT

Balance of cash at beginning of year	$1,318.64
Add: Total receipts for year	2,913.65
Total cash on hand during year	4,232.29
Deduct: Total expenditures for year	1,071.72
Balance of cash at end of year	$3,160.57

Audited by: Joe W. Guthridge Date: April 14, 1953

MINUTES OF THE ACADEMY MEETING
FRIDAY, MAY 8, 1953

The Annual business meeting of the Academy was held in Room 104, Mallory Hall, Virginia Military Institute, at 8 P.M. President Lloyd C. Bird, presided, and introduced Major-General Milton, Superintendent of the Virginia Military Institute, who welcomed the Virginia Academy of Science on behalf of the host institution. Following his remarks President Bird introduced Dr. Fisher, of the General Electric Company, who addressed the Junior Academy of Science meeting Friday morning; and Dr. Raymond Taylor, Assistant Executive Secretary of the AAAS. President Bird thanked the officers and Committee Chairman for their cooperation during his term of office. Mr. Dyer introduced Merle A. Mitchell of Booker T. Washington High School, Norfolk, who was a National winner in the Westinghouse Science Talent Search. Her essay submitted in this contest was entitled: "Mass Analysis of Crude Oil".

President Bird presented an Honorary membership in the Academy to Justus Cline, of Stuart's Draft. Mr. Cline was absent due to illness, and the certificate was given to Marcellus Stow for presentation to Mr. Cline.

The 1953 J. Shelton Horsley award was won by Mr. Stephan Burko and Dr. Frank L. Hereford, Department of Physics, University of Virginia, for their excellent joint paper "Deflection of High Energy Electrons in Magnetized Iron." Walter S. Flory, Jr., Chairman of the Research Committee, made this presentation.

Report of the Resolution Committee was made by Edward Harlow, and was adopted. It was moved, seconded and passed that copy be sent to Dr. E. C. L. Miller.

Report of the Place of Meeting Committee was made by I. G. Foster, Chairman, who read a letter of invitation from Colgate W. Darden, President of the University of Virginia, inviting the Academy to meet at the University in May, 1954. It was accepted unanimously.

Report of the Nomination Committee was made by Paul Patterson, and the following nominees were unanimously elected for the coming year.

Allan T. Gwathmey, President.

E. C. L. Miller, Secretary-Treasurer Emeritus.

Foley F. Smith, Secretary-Treasurer.

Irving G. Foster, President-Elect.

Walter S. Flory, Jr., Elected to Council for a period of five years.

Stanley B. Williams, Elected to Council for a one year term.

President Bird then turned the chair over to the incoming president, Allan T. Gwathmey.

President Gwathmey introduced Professor William Guy, and presented Professor Hubert N. Alyea, of the Frick Chemistry Laboratory, Princeton

University, who gave a highly interesting and entertaining address and demonstration of "Atomic Energy: Weapon For Peace."

The meeting adjourned following Professor Alyea's performance.

FOLEY F. SMITH, *Secretary*

MINUTES OF THE COUNCIL MEETING

OCTOBER 12, 1952, LEXINGTON

The meeting of the Council of the Virginia Academy of Science was held in the library of Mallory Hall, Virginia Military Institute, Lexington, Virginia, October 12, 1952. President Lloyd C. Bird presided at the meeting.

Present were Council members: Walter S. Flory, Jr., Ladley Husted, I. G. Foster, Sidney S. Negus, Marcellus Stow, Paul M. Patterson, Guy S. Horsley, Boyd Harshbarger, President-elect Allan T. Gwathmey, and Foley F. Smith. Colonel S. M. Heflin and Mr. Truitt, of the staff of Virginia Military Institute, were also present.

President Bird called the meeting to order at 9:45 A.M. The first order of business concerned the Virginia Academy Conference. It was proposed that the reading of committee reports be eliminated in order to save time, and be limited to five hundred words for printing in the Proceedings.

Marcellus Stow suggested that the reports be mimeographed in advance and available for each member desiring information prior to printing of the Proceedings. The report of the Business Committee, that of the Research Committee, and that of the Secretary would be read before the Conference; and copies of the reports should be sent to the Council in advance so that any controversial matters which might arise could be discussed before the meeting. It was properly moved and seconded that the Secretary instruct each person authorized to make a report to submit such committee report to the Secretary at least a week before the annual committee meeting, and that copies of such reports be mimeographed on letter-size paper and made available for all members who registered at the meeting.

It was further moved, seconded, and passed, that such reports, or summaries of four hundred words or less be sent to the Editor-in-Chief of the Virginia Journal of Science for publication, unless a more complete report for publication is required by the Council.

$2,500 of the general funds was authorized to be invested in recognized securities, the income of which is to be used for general expenses of the Academy.

Marcellus Stow reported on the status of the proposed Dismal Swamp Project for the Long Range Planning Committee. He stated that the lowering of the water table in the swamp, and program of Reforestation by the Camp Manufacturing Company, would gradually change the swamp from its present natural status, and consequently the proposed study would not have the interest that was contemplated. He suggested that a further study be made of the situation, and a further report made at the Annual Meeting.

President Bird read a letter from Henry Leidheiser of the Virginia Institute of Scientific Research, that suggested a "New Activities Committee".

It was suggested that the President answer Mr. Leidheiser's letter, and appoint him on the Long-Range Planning Committee.

President Bird told the Council about the William Ralston Memorial Award that had been established to encourage good expression in scientific writing. It was suggested that, subject to the approval of the Executive Committee of the Virginia Section, the Award might be handled advantageously through the Academy. After considerable discussion, the suggestion was approved in principle.

It was moved, seconded and passed, that, in addition to the Secretary, President-Elect Allan T. Gwathmey, be appointed as a delegate to the Academy Conference of the AAAS at the St. Louis meeting.

After considerable discussion it was moved and passed that the customary Academy dinner, both Junior and Senior, be eliminated.

The Council recommended that the President contact college and university authorities regarding the possibility of increasing the value of scholarships offered to State Science Talent Search winners, and also the possibility of continuing such scholarships for four years.

It was moved, seconded, and passed, that the fiscal year of the Academy be changed to correspond with the calendar year. This action is subject to the approval of the Academy at the Annual meeting. It was suggested that the Secretary and Editor-in-Chief work out details and conflicts which might arise due to such change.

Since such action would require change in the Constitution Article II, Section 2, which now reads. "The fiscal year of this organization shall be from April 1 to March 31." This to be changed to read: "The fiscal year of this organiaztion shall be from January 1 to December 31." Publication of this notice in the Journal shall constitute the proper notice.

It was moved, seconded and passed, that the present fee of $10.00 for the Collegiate Chapter be changed to $3.00 per year, for which such Chapters will receive one subscription to the Virginia Journal of Science instead of two.

Dr. Boyd Harshbarger discussed bids offered for publication of the Journal for the coming year, and on his recommendation it was moved, seconded, and passed, that the bids of the Pearisburg Virginian, by Malcolm Donald Coe, be accepted for two years. There being no further business the Council adjourned at 12:20 P.M.

Following lunch the President's Advisory Committee convened in the library at 2:00 P.M. Most of the members of the Local Committee on Arrangements were present and problems relative to the Annual Committee at V.M.I. were discussed for the benefit of the committee.

Present were: Major Nichols, Colonel Anderson, Messrs. Dobson, Jarman, Webb, of V.M.I.; Stow, Black, Husted, Brumfield, Jopson, Myster, Flory, Harshbarger, Obenshain, Patterson, Horsley, Weaver, Truitt, Gwathmey, Negus, Carroll, Foster, Smith, Bird, Colonel Heflin, Jeffrey, Mrs. Remsberg, and Mrs. Heatwole. Obenshain made a report to the group on the new set-up of the Speakers Bureau. Colonel Carroll, of V.M.I., reported on the activities of Collegiate members.

Mrs. Heatwole made a report on the plans for the program of the Junior Academy meeting and publicity that was being planned.

Colonel Anderson expressed the pleasure of V.M.I. in entertaining the Academy at its Annual meeting.

The meeting adjourned at 5 P.M.

FOLEY F. SMITH, *Secretary*

MINUTES OF THE JUNIOR ACADEMY OF SCIENCE BUSINESS MEETING

The eleventh annual meeting of the Virginia Junior Academy of Science was held on Thursday, May 7th, in the auditorium of Prescott Library on the campus of the Virginia Military Institute. The meeting was called to order by the president, Claude Barfield. The group was welcomed by the president of the Senior Academy, Mr. Lloyd C. Bird. Mr. Bird stated in his welcome, as a challenge to the Junior Academy members, that all new things come by hard work and research.

Next, the president introduced the incumbent officers of the Junior Academy, Ervin Tyler, President-elect, and Charles Chamberlayne, Secretary. He also introduced the members of the Junior Academy Committee.

Following the introductions, the secretary read the minutes of the 1952 meeting which was held at the Chamberlin Hotel on May 15th. He reported that 14 schools were represented at this meeting. The minutes were approved with no corrections and the secretary then went on to read reports of the business transacted at the three meetings of the Junior Academy Committee.

A roll call of affiliated clubs showed the following schools represented:

Andrew Lewis H. S.	Madison Heights H. S.
Radford H. S.	Buckingham Central H. S.
Norview H. S.	Martinsville H. S.
Newport News H. S.	Woodrow Wilson H. S.
Wilson Memorial H. S.	Thomas Jefferson H. S.
Lexington H. S.	Booker T. Washington H. S.
Lane H. S.	(Norfolk)

Many other schools were represented by individual affiliates.

The next item on the agenda was the reports of the various committees. Dr. Humphries recognized the members of her committee who made the selection for the E. C. L. Miller Award. Dr. Gwathmey reported that his committee had succeeded in having the Teacher-Sponsor Scholarship raised from one to two hundred dollars. Dr. Reynolds gave the list of judges who judged the individual and club exhibits. They were Dr. Marcellus Stow, Geology; Dr. William Hinton, Psychology; Dr. Lilliam Thompson, Biology; Dr. E. D. Miller, Biology; Dr. Fred L. Brown, Physics; and Dr. T. Nelson Baker, Chemistry. Dr. Reynolds stated that, with one or two exceptions, every judge had interviewed each exhibitor. Mrs. Heatwole gave a report on the work done by the Junior Academy Committee. She stated that there were 65 clubs this year, 54 of thoes being new affiliations. She commented on the JUNIOR SCIENCE BULLETIN which was published this year, and gave special thanks to Miss Susie V. Floyd and the Newport News High School print shop for making its publication possible.

The report of the nominating committee was then given by Miss Martha Robinson of Newport News High School. She introduced the candidates and briefly stated their qualifications. They were Jackie Chaffin, Martinsville, candidate for president; Eleanor O'Meara, Charlottesville, and Alex Gardner, Salem, candidates for secretary. Following the report the floor was opened for nominations. A motion was made, seconded, and carried to cast a unanimous ballot for Jackie Chaffin for president. Following this Eleanor O'Meara was elected secretary.

Following the recognition of the newly elected officers, the president installed his successor, Ervin Tyler. The meeting was adjourned by Mr. Tyler.

CHARLES H. CHAMBERLAYNE

MINUTES OF THE SECTION OF AGRICULTURAL SCIENCE [1]

T. J. NUGENT, *Chairman*

H. MARSHALL CLARK, *Vice-Chairman*

RODNEY C. BERR, *Secretary*

WESLEY P. JUDKINS, *Section Editor* (1956)

FRIDAY, MAY 8, 1953 – 9:00 A.M. – ROOM 234, MALLORY HALL

1. INSECTICIDES: RESEARCH

D. E. Greenwood; *Virginia Truck Experiment Station, Norfolk.*

Insecticidal research begins even before the first few grams of an agricultural chemical are made, and through the combined efforts of a research team, the product is evaluated to a point of successful production. When final application is made for label approval, a sound research and developmental program will have supplied the necessary facts relating to its effectiveness against insects, its safety to humans both from the standpoint of hazards in handling and possible dangers from residues remaining on treated produce, and above all, for the development of suitable analytical techniques for measuring the factors mentioned. Experiment Station personnel generally enters the picture after toxicology, analytical procedures, and other necessary preliminary phases have been started, and their primary function is to adapt promising compounds to practical agricultural use. The cost of developing an agricultural chemical is great but agriculture needs these pest control materials and industry is willing and able to provide them.

2. INSECTICIDES-REGULATORY LAWS.

J. Claggett Jones; *Virginia Department of Agriculture, Richmond.*

Since July 1, 1948, the Virginia Insecticide, Fungicide, and Rodenticide Law of 1948 has been in effect, superseding the old Insecticide Law of 1922. In place of its rather long and unwieldy legal name, it is commonly referred to as the Virginia Insecticide Law, the Virginia Pesticide Law, or the Virginia Economic Poison Law. Under the Law's definition an economic poison is any substance or mixture of substances intended for preventing, destroying, repelling, or mitigating any insects, rodents, fungi, bacteria, weeds, or other forms of plant or animal life or viruses (except viruses on or in living man or other animals) which the Virginia Commissioner of Agriculture shall declare to be a pest.

The purpose of the Law is to protect the health, welfare, and pocketbook of Virginia residents from intentional wrongdoers, from careless or ignorant violators, and from potential causes of accidents.

To carry out the intent and purpose of the Law, three essential procedures are provided under the Law. These are registration, inspection and analysis.

With over 2500 products registered, one can readily see that the enforcement of the Law is not only a large job, but an important one.

3. CONTROL OF MITES IN STRAWBERRIES IN VIRGINIA.

R. N. Hofmaster and D. E. Greenwood; *Virginia Truck Experiment Station, Norfolk.*

A number of acaracides were tested during 1951-52 at the Virginia Truck Experiment Station in an attempt to develop improved measures for mite control on strawberries. Particular emphasis was placed on cool weather treatments since damaging mite infestations often occur in late winter or early spring. Treatments with Systox, a systemic insecticide, approximately one month before harvest with 1 pint, or six weeks before harvest with 1.5 pints, of 48.1% emulsion per acre appear sufficient to insure good mite control through the harvest period. In 1951 one pint of Systox per acre applied to ripening fruit showed a residue (bioassay method) of only 0.1 ppm when harvested eight days later. None of the Systox treatments in 1952 had measurable residues as determined by the cholinesterase method. Although less effective than Systox, 10% Ovotran and 3% commercially prepared Aramite gave good control in early spring treatments and were superior to all other compounds. Combinations of parathion with sulfur and Ovotran produced significantly better results than any of these materials alone. The organic phosphorous compounds were characterized by a high initial kill and limited residual action.

4. EFFECT OF VARIETY ON THE ASCORBIC ACID AND CAROTENE CONTENTS AND ON THE YIELD OF SWEET POTATOES.

James F. Eheart, P. H. Massey, Jr., and R. W. Young; *Virginia Agricultural Experiment Station, Blacksburg.*

A moist type sweet potato variety study consisting of 8 varieties and 3 field replications was made at the Eastern Virginia Research Station, Warsaw, Virginia. Variations among varieties of the ascorbic acid, carotene, and moisture contents, No. 1 and total yields, and color and taste preferences were studied. Final ranking of the varieties by considering the above constituents showed the following choices: 1st, B-5999, Allgold, B-5941, and Goldrush; 2nd, L-240; 3rd, Ga. Bunch P. R. and Heartogold; and 4th, Unit I Porto Rico. This Southern Cooperative Group experiment was cooperatively conducted at the Georgia, Louisiana, Mississippi, North Carolina, Oklahoma, and Virginia Experiment Stations and the USDA Bureau of Plant Industry, Beltsville, Maryland.

5. THE EFFECT OF LIGHT, SOIL, pH, AND TRACE ELEMENTS ON THE ASCORBIC ACID, CAROTENE, THIAMINE AND RIBOFLAVIN CONTENTS OF TURNIP GREENS.

P. H. Massey, Jr., James F. Eheart and R. W. Young; *Virginia Agricultural Experiment Station, Blacksburg.*

An experiment was conducted in the fall of 1952, at the Virginia Agricultural Experiment Station, to study the effect of soil pH, light intensity and trace elements (none, applied to foliage, applied to soil), on the moisture, ascorbic acid, carotene, thiamine, and riboflavin contents of turnip greens. A split factorial design with six replications was used for this test. Three trace element treatments were applied: (1) none, (2) applied to foliage, and (3) applied to soil.

Under the conditions of this experiment, none of the factors studied had a significant effect on the ascorbic acid content of the greens. The significant results of the factors studied on the other constituents, on the dry basis, may be summarized as follows:

1. Shading two weeks prior to harvest resulted in an increase in carotene and a decrease in the riboflavin content.

2. Soil application of trace elements resulted in an increase in thiamine.

3. The no shade – no lime treatment gave an increase in the thiamine content.

4. The treatment combination of soil application of trace elements and no shade resulted in the highest riboflavin content.

6. TRACE ELEMENTS OF SOME VIRGINIA PASTURE PLANTS.

Nelson O. Price and W. N. Linkous; *Virginia Agricultural Experiment Station, Blacksburg.*

(No abstract available)

7. A SUGGESTED ROLE FOR AGRICULTURAL SCIENTISTS IN MINERAL PROSPECTING.

Richard V. Dietrich; *Virginia Polytechnic Institute, Blacksburg.*

In recent years there has been a drastic depletion of known mineral resources. To assure continued industrial development, either substitutes for or new supplies of these minerals must be found.

There are undoubtedly mineral deposits that have thus far escaped discovery because they are covered with soil. Soil analyses and plant analyses involving determinations of such trace elements as Co, Cu, Zn, Mo, B, and W commonly are made by agricultural scientists in attempts to determine the nutrient effects of very small amounts of certain elements. Because concentrations of these elements in soil and plants may reflect the chemical characteristics of the underlying bedrock, these analy-

ses may serve as a basis for reconnaissance geochemical and biogeochemical maps.

A plea is made to the agricultural scientists that make such analyses to make their results readily available to geologists.

8. THE RELATIONSHIP BETWEEN SIZE AND EFFICIENCY OF FEED UTILIZATION IN BEEF CATTLE.

J. E. Grizzle and C. M. Kincaid; *Virginia Agricultural Experiment Station, Blacksburg.*

A study on the relationship between weight and daily feed consumption from data collected on bulls and steers individually fed over a five-year period showed that the linear regression of daily feed consumption on weight explained a highly significant amount of the variation in feed consumption. After adjustment for linear regression, the data showed highly significant differences among periods and animals within groups. Group differences were highly significant in the 1950-51 and 1951-52 bulls and steers, and the group-period interactions were significant in all animals fed except the 1947-48 bulls and 1951-52 steers.

It appears from the data secured in this experiment that rate of gain is a better measure of efficiency than the ratio of gain to feed consumption unless adjustment is made for differences in weight or constant end weights are used. Pounds of feed per pound of gain as a measure of efficiency in feeding trials may be misleading. In general, the younger and therefore smaller animals tended to be more efficient because they ate less feed than larger ones. In these trials, rate of gain tended to be more or less constant for the period from weaning to fifteen months of age.

9. SILAGE STUDIES.

Paul M. Reaves and R. Emory Brubaker; *Virginia Polytechnic Institute, Blacksburg.*

I. Sulfur Dioxide as a Preservative.—Sulfur dioxide was added as a preservative to alfalfa silage. An average of 3.58 pounds of sulfur dioxide per ton of chopped material was used. The silage was well preserved and retained much of its green color. The silage did not have the normal odor of silage acids (lactic and acetic). Apparently the formation of sulfuric acid from the sulfur dioxide inhibited the production of the organic acids in the normal amounts. There was no evidence of butyric acid development. The alfalfa-sulfur dioxide silage was not so palatable as corn silage; however, when the cows became accustomed to it they ate it well and in large quantities.

II. The Carry Over of Weed Flavors.—A silo was filled with a mixture of approximately 55 percent clover and wheat stubble and 45 percent ragweed. Molasses was used as a preservative. The silage was fed

to milking cows 15 minutes to 1½ hours before milking time. The silage had a normal silage odor with no ragweed odor present. It was not so palatable as corn silage. Samples of milk were taken at time of delivery at the milk plant and showed no ragweed flavor.

10. THE EVALUATION OF STRESS IN DAIRY CATTLE.

G. C. Graf; *Virginia Agricultural Experiment Station, Blacksburg.*

Various stress conditions to which dairy cattle were subjected were evaluated by means of changes in respiration rates, heart rates, rectal temperatures, plasma lactic acid and creatinine levels, and electrocardiograms. The stress conditions evaluated were low ambient temperatures, exercise, dehorning, parturition, adrenaline injections, intermittent electrical shock, milking, and rumination. The changes in the plasma lactic acid level were found to be the most sensitive in most cases. Changes in heart rate and respiration rate were also valuable. Electrocardiograms gave results in the adrenaline injection series which portrayed the cardiac changes very vividly. Changes in the rectal temperatures and plasma creatinine level were found to be of little value in the evaluation of stress under the conditions noted.

11. A STUDY OF NEW MODIFIED BABCOCK TESTS.

C. C. Flora and G. E. Fisher; *Virginia Polytechnic Institute, Blacksburg.*

The first practical method for testing the butterfat content in milk was the Babcock test which was devised by Dr. S. M. Babcock of the University of Wisconsin in 1890. This test was adapted by the dairy industry because of its simplicity, cheapness, and accuracy.

A new detergent test was developed by Dr. Schain of the Veterans Administration, Staten Island, New York, in 1949. The Bureau of Dairy Industry has made a very thorough study of the detergent test and they have developed a test of their own using one detergent plus a water softener.

With fresh milk the results of the Schain test in our laboratory checked very close to the Babcock method when a monograph was used. Similar results were obtained with the BDI test without any corrections. The Schain test did not prove very satisfactory for testing cream.

12. INFORMATION WHICH CAN BE OBTAINED AT THE BEGINNING OF LONG-TIME CROPPING AND FERTILIZER EXPERIMENTS.

Russell K. Stivers; *Virginia Polytechnic Institute, Blacksburg.*

The hypothesis is advanced that the knowledge of soil differences occurring within replications or blocks at the beginning of a long-time cropping or fertilizer experiment will help greatly in the interpretation of

results. Examples of differences in crop response on plots treated alike are given. These differences in crop response are attributed to differences in soil fertility, differences in the incidence of soil borne plant diseases or parasites, and in soil physical differences. These examples are used to illustrate how the knowledge of soil differences occurring within a block may be used to evaluate the results from a long-time cropping or fertilizer experiment or to revise it.

13. A PICTURESQUE TRIP THROUGH THE DISMAL SWAMP OF VIRGINIA.

Elvin F. Henry; *Virginia Polytechnic Institute, Blacksburg.*

(A pictorial presentation, no abstract available.)

BUSINESS MEETING

At the close of the speaking program the annual business meeting was held. The following men were elected to hold office for the 1953-54 period:

Chairman – H. Marshall Clark, Tidewater Field Station, Virginia Agricultural Experiment Station, Holland.

Vice-chairman – Rodney C. Berry, Director and State Chemist, Department of Agriculture and Immigration, Richmond.

Secretary – R. W. Engel, Virginia Polytechnic Institute, Blacksburg.

Section Editor – Wesley P. Judkins, Virginia Polytechnic Institute, Blacksburg.

MINUTES OF THE SECTION OF ASTRONOMY, MATHEMATICS, AND PHYSICS [2]

S. M. HEFLIN, *Chairman*

L. W. WEBB, JR., *Secretary*

I. G. FOSTER, *Section Editor* (1956)

FRIDAY, MAY 8 – 10:00 A.M. – ROOM 111, MALLORY HALL

1. A New Theory of Convergence.

E. J. McShane; *University of Virginia.*

Every idea of limit contains a central part which, roughly stated, asserts that we can make f(x) stay in any one Y of a family Y of sets (for example, the family of all circles centered on a point p) by restricting x to lie in some set X of a family X. A certain simple restriction on the families X is needed if we wish to be able to prove that the limit of a sum is the sum of the limits. No further restrictions are needed. The resulting definition of limits is at least as general and convenient as any existing general theory, and unifies all limit-concepts into a single concept of rather simple type.

2. On the Embedding of a Sequence of Closed Sets in a Sequence of Arcs.

B. J. Ball; *University of Virginia.*

The sequence α of point sets will be said to be embedded in the sequence β of arcs provided that each term of α is a subset of some term of β and each term of β contains some term of α. The problem considered is that of obtaining conditions on a sequence α of sets in order that it be embedded in a sequence of arcs satisfying previously specified conditions. The space considered is the plane and it is assumed that each term of α is closed and totally disconnected and that the sum of the terms of α is bounded. Conditions are obtained which are sufficient, or in some cases necessary and sufficient, for α to be embedded in (a) a convergent sequence of arcs, (b) a sequence of mutually exclusive arcs, (c) a convergent sequence of mutually exclusive arcs, (d) an equicontinuous sequence of arcs, and (e) a convergent, equicontinuous sequence of mutually exclusive arcs.

3. Inelastic Scattering of D-D Neutrons.[1]

R. E. Garrett, F. L. Hereford, and B. W. Sloope; *University of Virginia.*

The inelastic scattering of D-D neutrons by various elements has been studied through observation of the gamma radiation emitted by the de-

[1] Supported by U. S. Navy Contract Nord 7873.

exciting residual nuclei. Gamma rays were detected in a 1″ diam. by 1″ thick NaI(T1) scintillation crystal in coincidence with detection of scatered neutrons in a 1″ cube of stilbene. Differential analysis of the NaI pulse height spectrum was performed for all such coincident events, yielding the energy spectrum of the gamma radiation associated with scattered neutrons. Coincidence rates were normalized relative to a BF^3 proportional counter which detected neutron intensity in the vicinity of the target. The gamma-neutron coincidence technique eliminated background gamma radiation. Four inches of paraffin shielded the stilbene crystal from both the deuterium target and NaI crystal. The following levels (given in Mev) have been observed in the indicated target nuclei: Mg: 1.40; Al: 0.84, 1.02, 2.2; Fe: 0.82, 1.45, 2.2; Cu: 1.1, 1.52, 2.14. Most of the Al, and Mg levels are in agreement with previously reported data obtained by similar methods.[2]

4. General Equation for Conics and Pseudoconics.

Richard E. Herron and D. S. Davis; *Virginia Polytechnic Institute.*

A geometrical construction that employs the convergence point (f, g) and the circle

$$(R\cos\theta - h)^2 + (R\sin\theta - k)^2 = a^2$$

of radius a and center (h, k) results in the general equation

$$r = \frac{g\ R}{g - f\tan\theta + R\sin\theta}$$

which holds for all conic sections (Davis, D. S., Va. J. Sci., *1* (1) 60 (1950)) and for the pseudoconics: Amelia, Boccanegra, Cavaradossi, and La Tosca (Davis, D. S., Va. J. Sci., *2* (3) 203-9 (1951)).

5. Pictures in Polars.

J. L. Troutman, J. M. Reynolds, and D. S. Davis; *Virginia Polytechnic Institute.*

Solely in the spirit of recreation, polar equations are offered for the outlines of apples, badges, butterflies, lemons, "schmoos," socks, and other familiar objects.

6. Lens Aberrations — Demonstration and Experiment.

I. C. Foster, *Virginia Military Institute.*

Simple apparatus for illustrating the five geometric lens aberrations is shown. All aberrations are made visible by projection on a screen. They may thus be seen by a large group. This apparatus can also be adapted for use as a semi-quantitative experiment for the laboratory.

[2] Robert V. Day, Phys. Rev. **89**, 908 (1953).

7. An Investigation of the Linear Relationship Between Resistance and Fourth-Root of Power Input of a Tungsten Lamp.

M. E. Cruser, Jr. and E. C. Stevenson; *University of Virginia.*

It is customary in elementary physics to determine and plot the resistance of tungsten and carbon filament lamps as functions of power input. We have found that when an evacuated tungsten lamp is operated on direct current, its resistance versus the fourth root of the power input is a straight line for a range of power from five per cent to three hundred per cent of rated value. It might be surmised from this that over the range of temperature change involved: (1) the radiation is proportional to the fourth power of the absolute temperature and conduction losses are insignificant; (2) the resistance of the filament is a linear function of its temperature; (3) the radiation emissivity is constant. When the temperature coefficient and emissivity are calculated from these and other data such as filament temperature and surface area, there is no satisafctory agreement with tabulated values; in fact, the latter show that both coefficients increase with temperature. It is a remarkable coincidence that the ratio of the effective temperature coefficient to the fourth root of the emissivity is a constant over such a wide range.

The above linear relation does not hold for gas filled tungsten or carbon filament lamps.

8. The Energy Loss of Mu-Mesons and Electrons in Sodium Iodide.

G. M. Snead and S. J. Stratis; *University of Virginia.*

Scintillation methods have been used to investigate the energy loss of electrons and cosmic ray mu-mesons in NaI(Tl) crystals. The thickness of the crystals were much less than the ranges of the particles so as to give a distribution of energy losses. The most probable energy losses and the energy loss distributions were compared with those calculated from Landau's[3] theory, with and without the density correction proposed by Halpern and Hall.[4] The mu-meson results agree within experimental error with the density corrected theory. The energy loss distributions for the electrons are much wider, and the most probable energy losses are 15% greater, than those predicted by theory. The latter is believed due to multiple scattering. The relative rise in energy loss with increasing electron energy is in good agreement with the density corrected theory.

9. Teaching Physics as a Profession.

S. M. Heflin; *Virginia Military Institute.*

The demand for good teachers in physics is great and the vocation is a laudable one. The influence of the teacher is immeasurable and

[3] L. Landau, J. Physics, USSR, 8, 4 (1944).
[4] O. Halpern and H. Hall, Phys. Rev. 57, 459 (1940).
Phys. Rev. 73, 477 (1948).

the rewards for imparting truth is a great satisfaction. The financial rewards have not been too high, but they are improving and we should continue our efforts along this line. We are proud of our profession and we should lend our influence to induce men of high character, keen minds, and patience to enter this field of endeavor.

10. Tensile Strength and Adhesion of Thin Films of Silver.[5]

Harold S. Morton, Jr.:[6] *University of Virginia.*

Work has continued at the University of Virginia on determination of the tensile strength and adhesion of thin metallic films.[7] The studies involve subjecting the films to high centrifugal fields. Thin silver films have been electrodeposited without preliminary "striking" on small cylindrical hardened steel rotors. The rotors have then been magnetically suspended and spun in a high vacuum, and the rotational speeds required to throw off the films have been measured for various film thicknesses. In agreement with previous results and in general agreement with theory, the tensile strength has been found to show a very abrupt increase when the film thickness is reduced to about 2.5×10^{-5} in.. In addition, the adhesion shows an increase at roughly 1.6×10^{-5} in.. Prolonged annealing at 300° C increases the adhesion. Alternate rapid cooling and heating between $-70°$ C and 90° C greatly reduces the adhesion, and facilitates tensile strength measurements at small film thicknesses. In general, adhesion has been found to be more sensitive to variations in electrodeposition procedure than has tensile strength.

11. The Equilibrium Ultracentrifuge.[8]

A. Robeson, N. Snidow, and J. W. Beams; *University of Virginia.*

A 7.5-inch diameter ultracentrifuge rotor is magnetically suspended in a vacuum chamber (pressure 10^{-6} mm. Hg) and driven to operating speed by an air turbine below the chamber. The turbine is connected to the rotor with a thin flexible shaft which passes through a vacuum tight gland and which is disengaged from the rotor at operating speed. The rotor coasts freely during the observations and loses less than 1 rps per day. The concentration across the ultracentrifuge cell is determined by the refractive index measured by an interferometer arrangement which employs both white light and monochromatic fringes. A shift of 0.05 fringe is measurable. The rotor speed may be measured to one part in 10^6 and the rotor temperature maintained constant to 0.01° C. The apparatus is especially adaptable to molecular weight determinations in the range from 300 to 10,000.

[5] Supported by Navy Bureau of Ordnance.
[6] National Science Foundation Fellow.
[7] Beams, Walker and Morton, Phys. Rev. 87, 521 (1952).
[8] Supported by Navy Bureau of Ordnance.

12. Magnetic Balance.

Walter E. Lotz, Jr.; *University of Virginia.*

Beams [9] observed that when a small steel sphere was suspended in the magnetic field of a solenoid, the current in the solenoid being controlled by light reflected from the sphere and the space surrounding the sphere was evacuated, the sphere dropped a measurable distance. Using a microscope to observe the position of a 1/64″ sphere, he was able to detect changes of mass of 10^{-8} to 10^{-9} gram.

Theoretical considerations indicate that mass changes as small as 10^{-9} grams may be observed if the servo-mechanism holding the sphere in suspension is sufficiently stable. The mass change may be detected by observing changes in the solenoid current, changes in the position of the supported sphere, or changes in other parameters of the support control system. The theory predicts that in the ultimate, the magnetic balance is more sensitive than the chemical balance to small differences in mass.

A balance has been constructed incorporating modulated position error signals and electrical recording of mass change deflections. It is expected that mass changes as small as 10^{-9} grams will be observable.

13. Proton Resonance Absorption Fluxmeter.

R. T. Wagner; *University of Virginia.*

A proton resonance fluxmeter was built with the object of accurately measuring an approximately 600 gauss field strength produced by an air core solenoid used for magnetic suspension of steel rotors. Hahn and Knoebel's [10] circuit was modified to permit resonance detection using 0.1 cc. proton samples. Weak fields and reduced proton sample volume combine to place a lower limit of 400 gauss measuring ability of this fluxmeter. Other nuclear resonance absorption methods were tried [11] which gave similar results. The effect of inhomogeneity of the solenoidal field and other factors which combine to place limits on the use of proton resonance fluxmeters will be discussed together with oscillograms of observed resonances. Schematic diagrams of circuits used to detect resonance will be shown.

14. Gyromagnetic Ratios.

Glen S. Waterman; *University of Virginia.*

A new and direct method of measuring the gyromagnetic ratios of ferromagnetic substances, with the possibility of high ultimate precision, is currently under development at the University of Virginia. A minute sphere or cylinder of the sample material is supported, frictionlessly in vacuo, symmetrically between two identical, vertical axes, air-core sole-

[9] J. W. Beams, Rev. Sci. Inst. **21**: 182, (1950).
[10] Hahn and Knoebel, RSI, **22**, 191 (1951).
[11] Pound and Knight, RSI, **21**, 219 (1950).

noids. The field strength impressed on the sample induces a dipole magnetic moment proportional to the sum of the coil currents. The supporting force is equal to the product of the magnetic moment with the vertical component of the gradient of the impressed field, which is proportional to the difference of the coil currents. Since the gradient H′ and the field H are independently controlled, the sample may be held in suspension for a large change in impressed field, and thus for a large change in the magnetic moment of the sample. The gyromagnetic ratio causes a rotation of the sample, which can be observed, and together with observations of the coil currents and a knowledge of the coil constants and measurements of the samples, simple algebra permits a determination of the gyromagnetic ratios.

15. Correction of Watches by Induced Oscillations.

L. G. Hoxton; *University of Virginia.*

It is known that watches, hung on pins, may change their rates while executing pendular vibrations. No systematic treatment, if it exists, has yet been found by the author.

An experimental study with bifilar suspensions is here reported. The problem is considered in terms of: (1) a vibrating system with two degrees of freedom and (2) forced oscillations.

The vibrating elements considered are (a) the balance wheel and (b) the rest of the watch with a suspending cradle, called the "frame". The balance "drives" the frame, for the energy derived from the mainspring is delivered only slightly to the frame except through the balance.

From (1) the watch will lose or gain according as the balance and frame are together or opposite in phase. Further, in virtue of (2), these phase relations can be sufficiently predetermined through control of the free period of the frame.

Application is made to pins, illustrated here by an example. A Hamilton 992B, hung on a .25 mm. pin, lost; on a 2.4 mm. pin, gained; the rates being 8 to 15 sec./hr. On a 3.0 mm. pin it would gain or lose, the uncertainty residing in the initial conditions which are unknown close to a state of resonance.

16. Magnetic Suspension Circuits.

Joseph Swingle; *University of Virginia.*

17. A Double Ultracentrifuge Cell.

J. W. Beams and H. M. Dixon; *University of Virginia.*

The analytical ultracentrifuge may be used to determine the concentrations of substances in solution as well as their molecular weights. A troublesome source of uncertainty in concentration measurements is the distortion of the centrifuge cell by the large stresses produced in a high speed rotor. The effect of distortion on concentration determinations may

be eliminated to a first approximation by a double cell consisting of two sector shaped wells side by side having the same quartz windows and cell housing. If one sector is filled with a solution of the molecular species whose concentrations are to be determined and the other sector is filled with the solvent, a conventional Thovert-Philpot-Svennson cylindrical lens and slit optical system will superpose a baseline on the same photographic plate which shows the index of refraction changes produced by the sedimenting substances.

18. Ferromagnetic Deflection of High Energy Electrons.[12]

Stephan Berko and Frank L. Hereford; *University of Virginia.*

Deflection experiments in magnetized iron show the macroscopic B to be the effective magnetic vector acting on mu-mesons. An experiment by Alvarez[13] in 1934 indicates, however, negative results for Radium C $\beta-$ rays. In a recent paper[14] Wannier showed that the magnetic deflection is separable from multiple scattering only at higher electron energies. The experiment to be described uses magnetically analysed 7.4 Mev electrons from the B^{11} (d,p)B^{12} ($\beta-$)C^{12} reaction. The collimated electron beam is scattered by an iron (Vanadium Permendur) sheet and is detected by a movable counter telescope. Multiple scattering curves are taken with the magnetic field in the iron in both directions. From the shift of the scattering distributions, the effective magnetic field is computed and found to be the macroscopic flux intensity B, showing therefore no short range electron-electron forces at these energies.[14] Saturation effects will be discussed.

19. The Polarization of Annihilation Quanta and the Einstein, Podolsky, Rosen Expeirment.

F. L. Hereford and S. Berko; *University of Virginia.*

The argument presented by Einstein, Podolsky, and Rosen[15] (EPR) purporting to demonstrate the incompleteness of the quantum mechanical description of the physical world has been refuted on theoretical grounds by several authors.[16] To demonstrate their contention EPR introduce a hypothetical experiment. Recent measurements[17, 18] of the correlation between polarization states of positronium annihilation quanta can be shown to be analagous to the EPR experiment. In the case of the annihilation quanta their argument leads to the conclusion that quantities which represent both quantum and classical descriptions of the polarization of light do not represent a complete description (one which contains

[12] Supported by Office of Ordnance Research, U. S. Army.
[13] L. Alvarez, Phys. Rev. 75, 225 (1934).
[14] G. Wannier, Phys. Rev. 72, 304 (1947).
[15] A. Einstein, B. Podolsky and N. Rosen, Phys. Rev. 47, 777 (1935).
[16] See D. Bohm "Quantum Theory" (Prentice-Hall Inc., New York, 1951) p. 611 for a complete discussion.
[17] C. S. Wu and I. Shaknov, Phys. Rev. 77, 136 (1950).
[18] F. L. Herfeord, Phys. Rev. 81, 482, (1951).

a mathematical counterpart for each "element of reality" as defined by EPR). The quantum mechanical formalism in which the state of a system is not precisely defined but can only be realized in interaction with a measuring device yields a satisfactory description which as shown elsewhere [16] is complete.

20. Some Proposed Experiments with Liquid Helium II.

J. W. Beams; *University of Virginia.*

Liquid Helium II below 2.19 K forms a thin film which creeps over surfaces and against gravity for heights of at least several meters. Although this film has been widely investigated, its true nature is not understood. In this paper it is proposed to partially fill a hollow, magnetically suspended steel rotor (provided with the proper baffles to present stirring both of liquid and vapor) with liquid helium II in such a way that the helium II films will be forced to creep from the periphery toward the axis in order to get out of the rotor. The rotor will then be spun to the speed just necessary to prevent the film from reaching a small circular opening in the rotor concentric with the axis of rotation. This will then give a measure of the force necessary to stop the creeping film. If the film is successfully stopped by the centrifugal field, then by pumping the helium vapor out of the axis of the spinning rotor very rapidly, the temperature of the rotor should be quickly reduced to a point where the vapor pressure of helium is negligibly small, possibly below 0.5° K. Apparatus for testing this proposal is under construction.

21. A Simple Method for the Measurement of the Surface Temperature of Rapidly Rotating Bodies.

A. R. Kuhlthau and E. M. Foley; *University of Virginia.*

A simple method for the measurement of the surface temperature of objects with which one is unable to make contact has been developed. The technique involved the measurement of the infrared radiation from the body and the comparison of this radiation with that received from a similar body at known temperature. A lead sulfide cell is used as the detector and the radiation beam is modulated mechanicaly at a frequency of 10 c.p.s. The ten cycle output of the cell is then amplified by a tuned amplifier whose output may be calibrated to give the desired temperature directly. Calibration methods are discussed. Temperature differences of 0.25° C are readily measurable in the vicinity of room temperature or lower and at higher temperatures, this sensitivity increases to about 0.1° C. With appropriate modifications of the apparatus it is possible to increase this sensitivity at all temperatures.

22. Astrometric Orbit of Gamma Geminorum.

Harold L. Alden and V. Osvalds; *University of Virginia.*

The variable radial velocity of Gamma Geminorum was discovered by Burns at the Lick Observatory in 1903. In 1912 Harper at the Dominion Observatory derived an orbit with a period of six years and a semi-major axis of the order of one astronomical unit. Measures of radial velocity made subsequently fail to fit this credit. However, because of its possible angular dimensions, it seemed to warrant astrometric study.

Forty-eight plates were taken with the McCormick telescope between March 1946 and March 1952. These have been measured by Osvalds. After eliminating the parallax and proper motion, the residuals show no significant correlation with the six year period in either coordinate. A period of 300 days would reduce the residuals slightly. This period seems to be rued out, however, by the radial velocity observations.

23. Population Groups Among Stars of Spectral Type G.

A. N. Vyssotsky; *University of Virginia.*

Two groups of G dwarfs have been distinguished spectroscopically both at the Yerkes Observatory among bright stars and at the McCormick Observatory among faint stars. In one group the solar motion and the dispersion in the peculiar motions are only two-thirds as large as in the other. A similar spectroscopic differentiation among K giants indicates that the first group is more closely connected with the spiral structure of the galaxy than is the second.

24. Effect of Containmation on Transmission and Reflection of Light by Thin Metal Films.

H. Y. Loh and Peter Cheo; *Virginia Polytechnic Institute.*

Silver and copper thin films of controlled thickness have been made by evaporation and their transmission and reflection of monochromatic light studied in a vacuum. It was noted that at low pressure they are very sensitive to grease vapor. The effect on transmission and reflection is tremendous. It may cause a change as much as several hundred percent of their original values in some cases depending upon the thickness of the film. The cause of the effect is discussed.

25. A Report on the Washington State Bolide of May 10-11, 1952.

Charles P. Olivier; *Flower Observatory, University of Pennsylvania.*

On the night of 1952 May 10-11 at 12:27 A. M., P. S. T., a very brilliant bolide or detonating fireball passed over the southwestern part of the state of Washington and ended to the northeast of Seattle. It was so brilliant and the sound effects so intense that great alarm was caused locally, some thinking that a bomb had been dropped. Data were

gathered for the American Meteor Society by Prof. J. Hugh Pruett, University of Oregon, and independently by Prof. C. C. Wylie, Iowa State University, working under a grant from Office of Naval Research. All these reports were turned over to the undersigned, and this paper contains the results. The object began at a height of 132 km., ended at 14., with a path length of 194 km. It moved with direct motion and its orbit had a small inclination. Remarks will be made as to how members of the Academy can aid in similar work.

BUSINESS MEETING

The following officers were elected for 1953-1954:

Chairman: L. W. Webb, Jr.

Secretary: H. Y. Loh

Section Editor: I. G. Foster.

MINUTES OF THE SECTION OF BACTERIOLOGY [3]

W. FRENCH SKINNER, *Chairman*

P. ARNE HANSEN, *Vice-Chairman*

H. J. WELSHIMER, *Secretary*

J. DOUGLAS REID, *Section Editor* (1956)

FRIDAY, MAY 8 – 10:00 A.M. – ROOM 434, MALLORY HALL

1. The Use of Ovotran in Mite Infestations of Laboratory Animals.

James A. Hancock, Jr.; *Medica College of Virginia.*

Stock rats and experimental mice in our laboratory became infested with the tropical rat mite, *Bdellonyssus bacoti* (Hirst). A working sample of a new miticide, "Ovotran" (parachlorophenyl, parachlorobenzenesulfonate), was obtained from Oow Chemical Company. The infested animals were dusted with a 10% mixture of the active ingredient in talcum powder twice weekly for a total of seven applications. These animals were observed to be free of the parasites after two weeks of treatment, and reinfestation had not occurred three months later.

Since some of the experimental mice were infected with the virus of lymphocytic choriomeningitis, the possibility of the mite serving as a vector of this disease was considered. Transmission of the virus to normal mice by adults and nymphs engorged with the blood of infected animals showing a viremia was not demonstrated either by experimental infestation or by inoculation of ground suspension of the engorged mites.

No toxic symptoms were observed in the animals treated with the miticide.

2. Action of Lysozyme on Several Cell Structures of *Bacillus megaterium.*

H. J. Welshimer; *Medical College of Virginia.*

The action of lysozyme on cells of *Bacillus megaterium* killed with 15% formaldehyde was observed.

The capsule and cell wall substance are attacked by lysozyme, indicating the presence of an acetyl aminopolysaccharide component in these structures.

Chains of bacilli are disrupted by the lysozyme as a result of lysis of the walls of adjoining cells.

3. The Cultivation of *Leptospira* in Chick Embryos.

Catherine M. Russell; *University of Virginia.*

Leptospira icterohemorrhagiae has been cultured in chick embryos, using the allantoic, the yolk sac, and the amniotic routes of inoculation.

Experiments employing 4-, 8-, or 12-day-old embryos revealed that the infectivity of the organisms decreased with the age of the embryos inoculated.

Thirty-seven serial passages of *L. icterohemorrhagiae* in 4- to 6-day-old embryos did not increase or decrease the virulence of the organism for the chick embryo.

4. Primary Isolation of Johne's Bacillus *Mycobacterium paratuberculosis* from Bovine Intestinal Mucosa.

Robert H. Miller and P. Arne Hansen; *Department of Bacteriology and the Live Stock Sanitary Service Laboratory, University of Maryland.*

The success of primary isolation of Johne's bacillus from the bovine intestinal mucosa appears to be increased by the addition of neomycin (8 units per ml.) to the isolating medium. Many organisms found in the intestinal mucosa and acting as contaminants are inactivated by the antibiotic in this concentration, while Johne's bacillus is quite resistant to the neomycin.

Data thus far accumulated indicate that Finlayson's egg medium, in which both brilliant green (0.03%) and neomycin are incorporated, is an efficacious medium for the primary isolation of Johne's bacillus.

5. A Comparison Between Original Lowenstein's Medium and Lowenstein's Modification in the Culture of *Mycobacterium tuberculosis.*

Walter J. Williams, John W. Pond, and Jo Soles; *City Health Department Laboratory, Richmond;* and Geraldine Paul; *University of Richmond.*

In the comparison of 240 positive cultures simultaneously cultured on original Lowenstein and on Lowenstein's Modification media, it was found that in 50% of the cases original Lowenstein gave positive cultures whereas the Modification medium gave none. In 12.9% the Lowenstein's Modification gave positive cultures whereas the original did not. In the remaining 37.1% the cultures were positive on both media.

In view of the above, it is felt by the authors that it is highly advisable to include both original Lowenstein and a medium containing a reduced amount of glycerin in the routine culture procedure for the tuberculosis program.

6. The Use of the 24 Hour Egg Count in the Evaluation of Paragonimiasis.

Michael Potter; *Department of Microbiology, School of Medicine, University of Virginia.*

Quantitative studies of egg production of the lung fluke *Paragonimus westermani* provide a means of study of the disease in the human. By

means of a simple technique reliable information can be obtained from patients: information regarding the degree of infestation, the response to therapy, and the natural history of the parasite in the human host. Data regarding these three points are compiled and presented from case material.

BUSINESS MEETING

The following were elected to take office January 1, 1954:

Chairman: P. Arne Hansen

Vice-chairman: H. J. Welshimer

Secretary: William F. Lawrence

A. E. Fuller was elected Alternate Councilor of the Virginia Branch of the Society of American Bacteriologists.

MINUTES OF THE SECTION OF BIOLOGY [4]

H. G. M. JOPSON, *Chairman*

ZOE WELLS CARROLL BLACK, *Vice-Chairman*

VERA B. REMSBURG, *Secretary*

ROBERT T. BRUMFIELD, *Section Editor* (1957)

FRIDAY, MAY 8, 1953 – 9:00 A.M. – ROOM 147, MALLORY HALL

1. The Taxonomic Significance of Megagametogenesis in *Tiarella cordifolia*. L.

John M. Herr; *Washington and Lee University.*

Megagametogenesis in *Tiarella cordifolia* L. follows the normal or polygonum type except for several marked deviations. The polygonum type is considered the most generalized mode of megagametogenesis and is represented in the herbaceous saxifrages by *Saxifraga ligulata, S. sponhemica, S. cordifolia, S. crassifolia,* and *Heuchera brixoides.* Variation from the generalized type occurs in *S. granulata, S. virginiensis, Francoa ramosa, Parnassia palustris,* and *Chrysoplenium* in addition to *Tiarella.* From the degree of variation, the present taxonomic position of the variant and generalized saxifrages can be suggested. Thus, on the basis of spore arrangement, the position of *Tiarella cordifolia* is close to that of *S. granulata* and *S. virginiensis,* but is apart from these species with regard to the development of the spore. Placing *Chrysosplenium* close to *Tiarella* also seems warranted because of their similarity regarding the extent of the nucellus.

2. Discovery of *Forsstromeria ohioense* in Virginia.

Paul M. Patterson; *Hollins College.*

In 1846 Sullivant issued his exsiccati, *Musci Alleghaniensis,* and the label on No. 89 is a new species, *Leptodon ohioeniss* with its description on the label. It was issued again as Nos. 235 and 354 in *Musci Boreali Americani.* It has never been collected since, not even at the type locality. It was found in some abundance on an arbor vitae tree in 1952 at Natural Bridge, and compares well with the type species. Both *Leptodon* and *Forsstromeria* are currently used for the genus to which this species belongs. A study of the nomenclature convinces the writer that the latter is the valid generic name.

3. A Simple Demonstration of the Effect of Heteroauxin on Plant Growth.

Robert T. Brumfield; *Longwood College.*

Sections cut from dandelion scapes and floated on heteroauxin solu-

tions exhibit varying growth responses according to the concentration of heteroauxin. For class demonstration a suitable range is 0, 1, 10, and 100 ppm. After 24 hours, the increase in length of sections from scapes bearing buds and those bearing flowers is roughly proportional to the concentration. In general, sections of scapes bearing fruits show the greatest increase in length in the lower concentrations but the results are not so consistent as is the case with sections of scapes bearing buds of flowers. In a class exercise the instructor may call attention to the possible mechanism of control of scape length in the intact plant.

4. The Sex Chromosomes of the Domestic Cat.

L. Husted and George Walker; *University of Virginia.*

A study of the spermatogonial divisions in the cat, *Felis domestica*, has shown 38 chromosomes. Morphologically distinguishable x and y chromosomes of the type recently reported by Makino and Tateishi are not found in the individual examined. The x and y chromosomes at metaphase I are associated as a rod bivalent by a single chiasma less frequently and as a ring bivalents with two chiasmata more frequently than found by Koller.

5. A Study of the Cyclic Behavior of the Testis of *Cambarus longulus longulus* Girard, with Notes on the Juvenile Males.

Vera B. Remsberg; *Longwood College.*

The three-lobed testis was found to undergo two cycles of sperm production. One occurred from May to September and the other from October to May. This was based on the examination of 389 specimens. All stages of spermatogenesis were obtained during the summer cycle. The diploid chromosome number is probably 196. The sperm is non-motile and possesses five or six rays which unfurl like a pin-wheel in water. The only correlation between the cyclic behavior of the testis and dimorphism in males was seen in the greater quantity of sperm produced by form II males.

6. Bernard Mikula's Collection of Mosses in Virginia.

Paul M. Patterson; *Hollins College.*

In collections over the State, principally of seed plants, Mr. Mikula, in conjunction with field work on a problem in graduate studies at the College of William and Mary made approximately 750 collections of bryophytes during the summers of 1949-52 in 36 counties in all of the physiographic provinces of the State. Collections of *Sphagnum* were well represented. New county records were obtained for a number of the rarer hepatics, peatmosses, and mosses. Reported in the state for the first time are *Polytrichum commune* var. *perigoniale* and *Sphagnum cuspidatum* var. *serrulatum.*

7. Apparent Competition Between Two Groups of Crayfishes in the Southeastern States.

Horton H. Hobbs, Jr.; *University of Virginia.*

While several instances of the more primitive crayfishes occupying the peripheral range of the genus *Procambarus* may be cited, one of the most precise examples involves the geographical relationships of two groups which inhabit lotic situations in the southeastern Piedmont and Coastal Plain provinces. The members of the less specialized Pictus Group occupy a discontinuous range which lies, for the most part, in the younger Coastal Plain, while the members of the more advanced Spiculifer Group are more abundant in the older Piedmont Province. In certain areas in the Coastal Plain, however, the latter appears to have invaded the peripheral zone and to have replaced the primitive Pictus stock. In relatively few streams are representatives of both groups found together.

8. Observations on Testicular Behavior in the Crayfish, *Cambarus montanus acuminatus* Faxon.

Benjamin H. Word Jr.; *University of Virginia.*

The three-lobed testis of the crayfish is similar in organization to that of other compound alveolar glands. Within the terminal acini, the spermatogonia undergo the usual mitotic and meiotic division to produce nonmotile spermatozoa. The latter appear to be discharged from the acini into the collecting tubules by the action of certain peripheral syncytial masses within each acinus. Following the discharge of the spermatozoa, the acinus disintegrates. In the meantime, there has been a proliferation of additional acini from the functional collecting tubules, and here a new cycle of spermatogenesis is initiated.

9. The Effect of Indole-3-Acetic Acid on Regeneration and Spore Germination in Mosses.

Suzanne Scollard; *Hollins College.*

Scant data were obtained on the regeneration of sporophytes in a number of species due to the molding and decay of setae. However, *Mnium cuspidatum* developed from half-mature to completely-mature sporophytes on 100-200 ppm. indole acetic acid agar without regenerating protonema. With spores of *Funaria hygrometrica* and *Scapania nemerosa* on mineral agar media containing indole acetic acid above 50 ppm., spore germination was completely inhibited. With concentrations of 5, 10, and 25, ppm., however, germination and protonemal development were strikingly accelerated, the optimum occurring at 5 ppm.

10. Aquatic Plant Life in Virginia.

A. B. Massey; *Virginia Polytechnic Institute.*

Plant life in water and wet situations is of importance in our economy. Vegetation of this type has a prime influence on the life of waterfowl as a source of food. This is of specific importance in the Virginia Coastal Plain area along the major flyways of the migratory species. Also, such plants are sources of food and shelter for certain species of non-game birds and mammals which inhabit marshes, swamps, or shores. On the other hand, aquatic and semi-aquatic plants are of significance in soil building and in reducing, if not preventing, erosion. In fish ponds some of the aquatic plants are a source of food and shelter for fish; however, the plants in ponds must be kept under control or they will become a menace. This is a preliminary report of a study of the kind of plants to be found in wet habitats, their distribution and abundance in the State. An annotated check list is in preparation.

11. The Nature of the Rhabdites in *Stenostomum virginianum.*

E. W. Pullen; *University of Virginia.*

Preliminary work, which seemed to indicate a relationship between rhabdites and the adhesive hull commonly found about this rhabdocoel, prompted experimentation to determine the nature of the rhabdite and its significance. Well developed single- and double-zooid individuals were stained in Bismarck brown and then agitated severely, fixed, and sectioned. The fixation of these experimental animals was excellent and they exhibited an epidermis which contained reddish-brown rhabdites. The control animals, on the other hand, were not vitally stained but were taken directly from the culture medium and were treated precisely as were the stained animals. The control animals had a thick mucous envelope about each animal and the fixation was poor; no rhabdites were visible. It appears that in the experimental animals, the rhabdites were bound by the vital stain so as to be ineffective in secretion while in the control animals, mucous material was produced. The observations strongly indicate that rhabdites are mucous organelles of the epidermal cells proper, and that these intracellular bodies are responsible for mucous production in this Turbellarian. These conclusions are further supported by the positive staining of rhabdites with mucin-specific stains.

12. The Spermatogenesis of Two Hematotaeniid Cestodes.

Lee T. Douglas; *Emory and Henry College.*

Previous information available on spermatogenesis in cestodes is meager. The present study, based on two undescribed cyclophyllidean cestodes of the Nematotaeniidae, has shown that about sixteen spermatogonia fuse to form a cytophoric syncytium. Immediately after fusion, the prophase of the first maturation division begins. Maturation in all of the spermatocyte nuclei associated with one cytophore is simultaneous. During the pro-

metaphase of both matuatiorn divisions, the cytoplasmic bridges joining the primary spermatocytes are obliterated leaving individual spermatocytes to divide separately. In these divisions, the completion of cytokinesis was not observed – instead the spermatocyte nuclei (or spermatid nuclei) rejoin in the early telophase to again form a syncytium. Spermiogenesis is of the common type involving three centrioles and the development of a midpiece spiral from a filament (probably mitochondrial in origin). The only unusual feature of spermiogenesis is the elongation of the spermatid nucleus to the point that it appears filamentous in the mature spermatozoan.

13. Notes on the Occurrence of *Neoechinorhyncus cylindratus* in Fishes of Westhampton Lake.

Harry L. Holloway, Jr.; *University of Virginia.*

A study of specimens of *Neoechinorhyncus cylindratus* Van Cleave isolated from the alimentary canal of fishes belonging to the families Centrarchidae and Percidae indicate that *Micropterus salmoides* (Lacepede) is the natural definitive host. The relationship of this parasite to its "definitive" hosts is apparently somewhat generalized, at least to the degree that it may find "lodging" in two of the four families of fishes present in Westhampton Lake which were examined. Infections with this parasite, other than in the large-mouthed bass, seem to indicate an imperfect adjustment between host and parasite.

14. Curvatures in Timothy Roots Induced by Ultraviolet Radiation.

Robert T. Brumfield; *Longwood College.*

Primary roots of timothy seedlings exposed to ultraviolet (2537) radiation exhibit curvatures. Exposure to 96,000 ergs/cm.^{2} induced a curvature away from the source and reached a maximum about 60 minutes after radiation. The center of the curvature was about 1 mm. behind the root apex. Dosages of 192,000 ergs/cm.^{2} induced two curvatures. A curvature toward the source occurred soon after irradiation and reached a maximum in about 40 minutes, the center of the curvature being about 1 mm. behind the root apex. A second curvature away from the source occurred later, reaching a maximum about 80 minutes after irradiation. The second curvature was closer to the root apex than the first, the center of the second being about 0.5 mm. behind the root apex.

BUSINESS MEETING

At the business meeting of the Section of Biology, the following officers were elected, to serve for the year 1953-1954.

Chairman: Zoe Wells Carroll Black
Vice-chairman: Vera B. Remsburg
Secretary: Kenneth P. Stevens

MINUTES OF THE SECTION OF CHEMISTRY [5]

HENRY LEIDHEISER, JR., *Chairman*
ROBERT C. KRUG, *Secretary*
CARL J. LIKES, *Section Editor* (1957)

FRIDAY, MAY 8 – 9:00 A.M. – ROOM 102, MAURY-BROOKE HALL

INTRODUCTORY REMARKS. Chairman Henry Leidheiser, Jr.; *Virginia Institute for Scientific Research, Richmond.*

1. The Phase Transformation of Cobalt as Observed on Single Crystals.

   Victor J. Kehrer, Jr. and Henry Leidheiser, Jr.; *Virginia Institute for Scientific Research, Richmond.*

Cobalt undergoes a crystalline transformation from the low-temperature hexagonal close-packed structure to the high-temperature face-centered cubic structure at 420° C. Single crystal spheres of cobalt were heated and cooled through this transformation temperature and were found to retain their single crystalline nature. The two different structures were determined by the oxidation patterns formed on the crystals.

2. Copper Chelates of Some *beta*-Diketones.

   Connie Cole and Helen L. Whidden; *Randolph-Macon Woman's College.*

A spectrophotometric study was made of the copper chelates of 1-cyclopropyl-1,2-butanedione (I) and 1-cyclopropyl-3-phenyl-1,3-propanedione (II), two β-diketones containing the three-membered alicyclic ring. The composition of the complex for I and II was determined by Job's method of continuous variation [Vosburgh and Cooper, *J. Am. Chem. Soc.*, 63, 437 (1941)], and the stability constant for each complex was measured. The pK_D values were compared with values obtained by other investigators for acetylacetone and benzoylacetone. The influence of the cycopropyl ring on the stability of the chelates of I and II was ascertained from the comparison.

3. An Investigation of *beta*-Amylase of Sweet Potatoes.

   Camilla Floyd and Laura Bliss; *Randolph-Macon Woman's College.*

A comparison of the β-amylase activity of commercial "cured" sweet potatoes and untreated sweet potatoes was carried out. It was found

that the curing process, which involved heat treatment for an extended period of time, did not inactivate the β-amylase. β-amylase activity was measured by a determination of the amount of maltose formed by the action of the enzyme on soluble starch. A modified Hagedorn-Jensen was used for the maltose determination.

4. Chromatography in Quantitative Analytical Work.

Margaret Fitzgerald and Helen Whidden; *Randolph-Macon Woman's College.*

The purpose of this paper is to apply theoretical and historical information of chromatographic analysis and its technique to practical quantitative analysis.

Since chromatography is a relatively new method of analysis, its potentialities have not been explored to a great extent in any field of chemistry, and especially not in that of inorganic analysis. The discoverer, Tswett, and most others who have worked with this method have applied it in the field of organic separation and analysis.

The theory of chromatography set forth by Wilson and his approach is used as the basis of the theoretical discussion.

Most of the research upon which the experimental portion of the paper is based has been done with ion exchange resins and aluminum oxide. The setting up of apparatus and the difficulties encountered in the practical approach to this problem is discussed, as well as separations of certain inorganic ions and the quantitative recovery of these as determined by the spectrophotometer and the polarograph.

5. A Microcoulometric Method for the Measurement of the Relative Adsorption of Organic Substances on the Hydrogen Electrode.

Thomas C. Franklin and Ray Sothern; *University of Richmond.*

When two or more substances capable of being adsorbed upon a surface are placed in a solution in contact with that surface there is a competition among the various adsorbates for the available active surface area.

In the experiments performed thus far a platinized platinum electrode has functioned as the adsorbent, while hydrogen plus acetonitrile have been the adsorbates. The amounts of hydrogen adsorbed were determined from current-time curves obtained during the electrolytic oxidation of the adsorbed hydrogen. Upon the addition of a poison to the solution, there was found to be a decrease in the quantity of hydrogen adsorbed commensurate with the quantity of poison added.

6. The Preparation of Some 9-(Dimethylphenyl)-1,2-Benzanthracenes.

Frank A. Vingiello and Alexej Borkovec; *Virginia Polytechnic Institute.*

In connection with our work on an Army Ordnance contract we are preparing a series of 9-(dimethylphenyl)-1,2-benzanthracenes. A discussion of the progress we have made thus far in synthesizing these hydrocarbons is presented.

The Grignard reaction between o-chlorobenzaldehyde and α-naphthylmagnesium bromide gives 2-chlorophenyl-1-naphthylcarbinol, which is not isolated in the pure form but reduced with red phosphorus and iodine in glacial acetic acid to give 1-(*o*-chlorobenzyl)-naphthalene. This is then converted to the corresponding nitrile, *o*-(1-naphthylmethyl)-benzonitrile, by means of the von Braun reaction. The reaction of the appropriate Grignard reagent on this nitrile, followed by acid hydrolysis, gives dimethyl-2-(1-naphthymethyl)-benzophenone. The aromatic cyclodehydration of this ketone using a hydrobromic acid-acetic acid mixture gives the corresponding hydrocarbon, 7-(dimethylphenyl) benz-[a]anthracene.

7. Mass Spectrometer Analysis of UO_2F_2 in UF_4.

Russell Baldock, John R. Sites, L. O. Gilpatrick, and Howard E. Carr; *Oak Ridge National Laboratory.*

A time integration method has been developed for the quantitative analysis of UO_2F_2 contamination in UF_4. Data are collected from a sample held at constant temperature in the mass spectrometer until the sample is completely used up.

8. The Use of an Anion Exchange Resin for the Isolation of Small Amounts of Zinc.

Richard M. Rush; *Pratt Trace Analysis Laboratory, University of Virginia.*

The use of anion exchange resin (Dowex-1) for the isolation of small amounts of zinc prior to its spectrophotometric determination described.

9. GUEST LECTURE: Emission Spectroscopy in Chemical Analysis.

Ralph E. Thiers; *Pratt Trace Analysis Laboratory, University of Virginia.*

After a brief introduction to the basic ideas and apparatus of spectrochemical analysis there follows a discussion of the impact on analytical chemistry of analytical automatons of the "direct-reader" type. This is followed by a discussion of the probable importance of a new type of device called the echelle spectrograph. The paper is illustrated by slides and short movie films.

10. Dithizone Extraction of Sub-Microgram Quantities of Cobalt in the Presence of Ammonia.

John F. Williams; *Pratt Trace Analysis Laboratory, University of Virginia.*

The factors affecting and the difficulties encountered in the dithizone extraction of sub-microgram quantities of cobalt in the presence of ammonia is discussed.

11. Further Study on the Synthesis of Anilino-Methanol.

Joseph E. Sanders, Jr. and Edgar V. Russell; *Virginia Polytechnic Institute.*

The structure of methyl aniline-w-sodium sulfonate as C_6H_5NH-CH_2SO_3Na was verified. Qualitative tests indicate that anilino-methanol is formed, possibly as an intermediate product which loses water forming anilino-methylene which in turn polymerizes.

12. Tetrazolium Chlorides.

A. Garnett Richardson and J. Stanton Pierce; *University of Richmond.*

A series of 2,3,5-trisubstituted tetrazolium chlorides is being prepared for use as tissue indicators in cancer research.

13. A Study of the Methods Used for the Determination of the Rare Earth Elements in Substances containing High Concentrations of Calcium and Phosphorous.

Roger K. Hoover and J. B. Lucas; *Virginia Polytechnic Institute.*

This investigation was undertaken with the following points in mind: to reduce the number of steps involved, to increase accuracy, and to develop a method that could be applied to plant and bone ashes. Many of the methods in use are long and tedious and gave appreciable losses due to coprecipitation.

The method used in this investigation depended on finding the conditions for the minimum solubiity of the rare earth oxalates and hydroxides, precipitating them and allowing other elements to go into the filtrate. The solvent used in each case was one to one HCl and the precipitates were washed with 5% solutions of the precipitating reagents.

1. After ashing and dissolving the ash, the solutions were enriched with 25 milligrams of rare earth oxides, diluted to a convenient volume and precipitated with 10% oxalic acid at a pH of 0.7 to 1.0, filtered, washed, and burned to the oxides at 900° C.

2. The oxides were dissolved and the process repeated.

3. The oxides were again dissolved and then precipitated with NH_4OH from 1 M NH_4Cl solution. The hydroxides were filtered, washed, and again dissolved.

4. This process was repeated.

5. The last of the calcium was removed by a batchwise ion exchange treatment using Amberlite IR-120 in a 5% ammonium citrate-citric acid solution at a pH between 3.2 and 3.6.

6. The rare earths were then again precipitated with oxalic acid, filtered, burned, and weighed as the oxides, R_2O_3.

14. Reactivity of Primary Alkyl Bromides with Thiocyanate Ion.

Thomas I. Crowell; *University of Virginia.*

The rates of reaction of several primary alkyl halides with sodium thiocyanate in 95% alcohol have been measured. A minimum in the rate constant is found at *n*-butyl bromide, the rate increasing with growing chain engths until *n*-octyl bromide is reached, which reacts 11% more rapidly than *n*-butyl bromide. This phenomenon is shown not to be a medium effect. Isohexyl bromide, which is as reactive ann-hexyl bromide, is the smallest branched-chain molecule not to show considerable steric hindrance in this type of displacement reaction.

15. Solubilities of Some Inorganic Salts in Hydrogen Peroxide-Water Mixtures.

John D. Floyd and Paul M. Gross, Jr.; *University of Virginia.*

Solubility determinations have been made on the following salts at 0°, 15° and 25° C: NaCl, NaF, $NaNO_3$, KCl, KNO_3, and $LiNO_3$. These measurements were made as part of a program to study the solvent properties of liquids of high dielectric constant and mixtures of these liquids. The results of these determinations have been correlated with such properties as: ionic radii of solute particles, dielectric constant of solvent, heats of solvation or solution of the solute, and the effective size of the solvating molecule.

16. Electrodeposition of Aluminum.

Nelson F. Murphy; *Virginia Polytechnic Institute.*

The threat to our sources of tin has stimulated research on plating with aluminum. Several processes have been suggested which might have commercial significance. Organic solutions have shown promise, and use of molten mixtures of sodium chloride and aluminum chloride are being developed. There is need for improvement in the properties of both the bath and the deposit. Some addition agents have been discovered which improve the quality of the product and the speed of deposit.

17. The Electric Dipole Moments of Some N-Monosubstituted Benzamides.

James E. Worsham, Jr. and Marcus E. Hobbs; *Duke University.*

The dielectric constants and densities of dilute benzene solutions of a series of seven n-monosubstituted benzamides were measured and the

electric dipole moments calculated. The data were examined by intercomparison of the results of this series and by comparison with the results of a series of unsubstituted amides previously measured by Bates and Hobbs (J. Am. Chem. Soc. 73, 2151, 1951) in this laboratory.

The results indicates a preferred orientation of the substituent group such that the N-H bond of the amide group is "trans" to the carbonyl bond. Additionally, it was observed that the association which occurred with the monosubstituted amides was a linear alignment of the dipoles as opposed to the cyclic association found by Bates and Hobbs [J. Am. Chem. Soc. 74, 746 (1952)] for the unsubstituted amides in dilute benzene solutions.

18. Powder Formation During the Catalytic Reaction of Hydrogen and Oxygen on a Copper Single Crystal.

Bruce Wagner, Jr.; *University of Virginia.*

Previous investigations in this laboratory [Leidheiser and Gwathmey, J. Amer. Chem. Soc., 70, 1200 (1948)] have indicated that a copper single crystal forms a powder on the surface while undergoing the catalytic reaction of hydrogen and oxygen. Further study of this reaction has shown that this powder forms preferentially on the surface.

Powder formation is the result of a violent surface rearrangement during which macroscopic particles are formed on the initial surface.

Some proposed mechanisms for powder formation are discussed.

19. A Proposed Mechanism of Catalytic Rearrangement of Metal Surfaces.

R. E. Cunningham; *University of Virginia.*

Observation of catalytic rearrangement of metal single crystals has led to several conclusions, on the basis of which a theory of surface rearrangement is proposed. This concerns itself with the effect of the reaction energy, considering the geometry of the crystal surface.

The relationship between catalytic surface rearrangement and the preparation, inductive procedures, and use of promotors in catalysis is considered.

20. Some New Color Reactions for Trace Quantities of Boron.

Robert L. Grob; *Pratt Trace Analysis Laboratory, University of Virginia.*

A progress report will be made on a search for sensitive color reactions that may be employed in the development of a method for the determination of microgram quantities of boron.

21. Some New Sensitive Color Reactions of Magnesium.

Charles K. Mann; *Pratt Trace Analysis Laboratory, University of Virginia.*

Some seventy-five compounds were selected from about 1400 dye-stuffs and their color-lakes with magnesium hydroxide were observed. Several of thse yield bright colored lakes which offer promise as being useful reagents in the development of a sensitive colorimetric method for magnesium.

22. Some Errors in a Standard Gravimetric Procedure for the Determination of Sulfur in an Iron Ore.

William E. Shitehurst and Edgar V. Russell; *Virginia Polytechnic Institute.*

Samples of an iron ore were analyzed for sulfur by a standard gravimetric procedure and the barium sulfate was analyzed for impurities. Aluminum, silicon lead and calcium copreciated with the barium sulfate to a small extent. The occurrence and elimination of these errors are discussed.

23. Charles and Boyle's Law Apparatus for General Chemistry.

N. W. Allen and H. Ritchey; *Virginia Military Institute.*

A relatively simple apparatus that can be made for accurate results in illustrating Charles and Boyle's law in the General Chemistry laboratory has been devised. The average error of the students is about 0.312 per cent.

24. A Mathematical Analysis of Errors Involved in Reducing Sedimentation Constants to Water at 20° C.

Carl J. Likes; *Virginia Institute for Scientific Research.*

In order to compare the sedimentation rates of macromolecular substances under standard conditions it is customary to reduce experimental values of the sedimentation constant to water at 20° C. In cases where the experimental conditions differ markedly from those of the chosen reference state it will be shown that $S°_{20}$ values computed by means of the standard reduction equation lose some significance unless consideration is given to possible changes in the size and shape of the sedimenting particles.

25. The Preparation of Some 9-(Dimethylphenyl)-Anthracenes.

Frank A. Vingiello and Edward Kramer; *Virginia Polytechnic Institute.*

In connection with our work on an Army Ordnance contract we are preparing a series of 9-(dimethylphenyl)-anthracenes. We will discuss the progress we have made thus far in synthesizing these hydrocarbons.

o-Chlorodiphenylmethane is prepared by the Friedel-Crafts reaction between benzene and *o*-chlorobenzyl chloride using aluminum chloride as the catalyst. This is then converted into the corresponding nitrile, *o*-benzy-

benzonitrile by means of the von Braun reaction. The reaction of the appropriate Grignard reagent on this nitrile, followed by acid hydrolysis, gives 2'-benzyldimethylbenzophenone. The aromatic cyclodehydration of this ketone using a hydrobromic acid acetic acid mixture gives the corresponding hydrocarbon, 9-(dimethylphenyl)-anthracene.

26. Trimethylchlorosilane Derivatives of Organolithium Compounds.

F. M. Braswell and H. Ritchey; *Virginia Military Institute.*

Trimethyl, 2-pyridylsilane was prepared by reacting 2-lithopyridine in an ether solution with trimethy-chlorosilane. The turbid mixture is placed in a separatory funnel and water is added with shaking until two colorless layers result. The desired product is in the ether solution. The distilled product is a light brown liquid which boils at approximately 191° C.

27. A New Colorimetric Method for the Determination of Uranium.

John H. Yoe, Fritz Will, III, and Robert A. Black; *Pratt Trace Analysis Laboratory, University of Virginia.*

A procedure for the colorimetric determination of uranium (VI) with dibenzoylmethane will be presented. A bright yellow, stable complex is formed when the organic compound reacts with uranyl ions under specified conditions. The color reaction conforms to Beer's law.

28. Controlled Atmospheres in Spectrochemical Analysis.

Ralph E. Thiers; *Pratt Trace Analysis Laboratory, University of Virginia.*

Various effects of atmosphere other than air on spectrochemical techniques with the direct current arc will be discussed. Color slides and a short color movie will be used as illustrations.

29. Henry's Law Constants for Gases at High Temperatures.

Ray C. Elton and D. S. Davis; *Virginia Polytechnic Institute.*

Application of the Lagrange interpolation schedule [Davis, D. S., Chem. Met. Eng., 45 (7) 383 (1938); "Empirical Equations and Nomography", p. 61, New York, McGraw-Hill Book Co., Inc., (1943)] to the Henry's law constants for helium, hydrogen, nitrogen, and oxygen enables reliable estimation of these values over the range of 50° to 650° F. and extends the utility of the original data.

30. The Absolute Entropy of the Chloride Ion.

Elmer S. McKee; *Washington and Lee University.*

By use of a thermocell operating between small temperature differences, it is possible to determine the change in ntropy occurring in a half reaction. If only one ion is involved in this reaction, e.g., in the reaction:

$Hg + Cl^- = \frac{1}{2} Hg_2Cl_2 + e$ and if the entropy of the electron can be shown to be negligible, then the absolute entropy of the ion can be determined relative to the entropy values of solids as derived from the Third Law of Thermodynamics. This value may then be used directly to calculate potentials of half reactions and other thermodynamic properties, and perhaps, to elucidate the theory of aqueous solutions.

31. The Change of Entropy of the Chloride ion with Concentration and Type of Cation.

Elmer S. McKee and Bentz Howard, Jr.; *Washington and Lee University.*

The effect of concentration and type of cation on the entropy of the chloride ion in concentrated solutions was investigated. Possible explanations for the changes of entropy in these systems are postulated.

32. Distillation of Sea Water.

William H. Caines and Frank C. Vilbrandt; *Virginia Polytechnic Institute.*

A process has been developed whereby sea water is heated for a definite period of time and then aerated to liberate any free carbon dioxide and carbon dioxide released by the decomposition of bicarbonate. This results in the precipitate of calcium carbonate and magnesium basic hydroxide. The precipitate is filtered out and the resulting filtrate neutralized by acidification prior to evaporation in a sea water evaporator. The studies have been made on a laboratory pilot plant belonging to the Coast Guard and the U. S. Navy, to determine the effectiveness of the process in preventing scale formation on-board evaporators. Results of the tests have been graphed on a number of evaluations of the processing. The maximum reduction was 70% in the quantity of scale formed when processed under limited conditions.

33. Scientific Vocations—A Survey of Promotional Materials.

Dr. Lowell V. Heisey; *Bridgewater College.*

According to reports from many sources, our nation is being faced with an unprecedented shortage of scientifically trained personnel during the next decade. This paper discusses some of the possible reasons for this shortage and some of the steps being taken for its alleviation by educational institutions, industry, professional societies, and the government.

One of these remedial steps is the publication of an increasing amount of vocational literature for the purpose of acquainting high school students with, and encouraging them to choose vocations in science fields. The author has been making a survey of this type of literature and will present the more outstanding features of some representative examples of these publications.

Also some of the vocational guidance and promotional projects being used in other sections of the country will be discussed, with suggestions for our own area.

34. Evidence for Cis-Trans Configuration and Effective Conjugations of α-Phenylchalcones.

W. Bruce Black and Robert E. Lutz; *University of Virginia.*

Determination and interpretation of the ultraviolet absorption of the cis and trans α-phenylchalcones and of their 2-(4-nitro) and 3-(4-nitro) derivatives have demonstrated the configurations and conformations of the isomers. The conclusion has been drawn that the cis isomers involve effective conjugation of the trans stilbene system only, whereas the trans isomers involve effective contributions of both the cis stilbine and trans chalcone conjugations. The greater reactivity of the trans isomers toward nucleophilic (1,4) additions has been demonstrated and is consistent with and supports this conclusion.

35. Ring-Chain Tautomerism of Substituted Cis-β-Aroylacrylic Acids.

James W. Rinker, Colin L. Brown, and Robert E. Lutz; *University of Virginia.*

Resolution of the ultraviolet absoprtion spectra of their cyclic and acyclic derivatives show that α and β-phenyl-β benzoylacrylic acids exist in dilute 95% ethanol solutions as equilibrium mixtures of their cyclic and acyclic forms in which the cyclic forms predominate. In the case of α-phenyl-β-benzoyl-acrylic acid, it has been estimated that the equilibrium mixture consists of 70% of the cyclic and 30% of the acyclic forms. In alkaline solution both acids exist as the anions of their more acidic (acyclic) forms while in strongly acidic solution the equilibria lies in favor of the less acidic (cyclic) forms.

Ultraviolet absorption studies on the cis β-aroyl-α-and β-methyl-acrylic acids and related compounds show that the cis compounds in solution are cyclic but are open-chain in the form of the anions. The cis β-benzoyl-α-and β-methyl compounds and both β-aroyl-α-methylene-propionic acids have been made respectively from citraconic and itaconic anhydrides by Friedel-Crafts reactions. The structures and configurations have been demonstrated. The trans isomers are the stable forms; the cis isomers are labile; and the β-aroyl-α-methylenepropionic acids also are labile and the least stable of the three types. Interconversions of the various isomers are described.

BUSINESS MEETING

A nominating committee, consisting of H. Rupert Hanmer, Alfred R. Armstrong, and Lowell V. Heisey, nominated the following candidates for

officers of the Section of Chemistry for 1953-1954:

Chairman: Robert C. Krug
Secretary: J. Stanton Pierce

These officers were elected by a unanimous vote of the members present.

MINUTES OF THE SECTION OF EDUCATION [6]

JACK H. BOGER, *Chairman*

JOS. N. PAYNE, *Secretary*

F. G. LANKFORD, JR., *Section Editor* (1956)

FRIDAY, MAY 8, 1953 – 9:30 A.M. – ROOM 454, MALLORY HALL

1. Science Teaching in Virginia High Schools.

Percy H. Warren; *Madison College.*

The purpose of this study was to present data concerning the science offerings of Virginia high schools and the combinations of science subjects taught by teachers who were teaching one or more classes in science during the school years of 1946-47, of 1949-50, and of 1951-52. All of the data used were obtained from original sources in the files of the Virginia State Department of Education.

More than 50 per cent of the high schools in Virginia have a minimum science offerings of general science, biology, and chemistry. Notwithstanding this fact, more than 50 per cent of the teachers who taught one or more classes in science taught only one or two science classes. More than 60 per cent taught only one science and more than 85 per cent of the teachers taught no more than two classes in science. This is not a desirable situation for it appears that, in general, teachers who are giving the major portion of their instructional time to other subjects will not do superior teaching in science.

More than 95 per cent of the high schools offer instruction in general science. More than fifty per cent of the science teachers in this study taught this subject.

Instruction in physics is not available to youth in 80 per cent of the high schools of Virginia. High school principals frequently say that they would like to offer physics but are unable to obtain properly qualified teachers for this subject. The institutions responsible for the education of teachers in Virginia should formulate plans for the education of science teachers who are competent in the field of physics.

2. A Study of the Opportunities for Employment in Industry in the Norfolk Area of Virginia.

W. E. Lobeck; *Norfolk City Public Schools.*

The writer, being responsible for administering the Vocational Educational program of the Norfolk City Public Schools, was confronted with the lack of information regarding employment opportunities and training needs in the area. Previous surveys indicated a need for further study.

This study was set up to determine as far as possible the exact nature of these opportunities and needs.

The survey was limited to industrial firms employing fifteen or more workers and government installations. The industrial firms were grouped into three general categories; building trades, construction, installation and service; transportation, manufacturing and commercial output; and processing and manufacturing of commercial foods. Data were gathered on check sheets through personal interviews. The survey forms were in two parts, one for general information pertaining to company policies and attitudes toward education and training; and a second part for information about specific jobs.

The survey revealed that government installations employed the greatest number of industrial workers. Firms engaged in transportation, manufacturing and commercial output had the greatest number of non-government workers; building trades' ranked second in employment, notwithstanding the slack winter months. Commercial food firms had the lowest number of employees with Negroes predominating. The mechanic-apprentice ratio was below the national level in all groups. All firms had some form of employee retirement and part time employment was used extensively.

The basic training now offered is meeting some of the demands of industry. It appears, however, that steps should be taken to broaden the program in an attempt to meet a larger number of the employment requirements.

3. A Study of the Academic Success of Virginia's College Freshmen Who Enrolled in the State's Institutions of Higher Learning During the Fall of 1948.

Alfred L. Wingo; *State Department of Education, Richmond.*

It was the purpose of this study: to find relationships of the size of the enrollments in Virginia's public high schools to the academic success of the graduates of these schools as freshmen in the State's institutions of higher education; to find the extent to which freshmen studetns dropped out of college in Virginias' institutions of higher education; to identify the courses where the extremes in success and failure occurred; and to compare the academic records of Virginia's public high school graduates with the records made by graduates of public secondary schools outside the State and private secondary schools inside and outside the State.

The data tabulated were provided by the Registrars of twenty-two of the State's institutions of higher learning for whites and two for Negroes. These data were recorded by college personnel on cards for individual students.

Of Virginia's high school graduates 12.0% of the white students and 14.2% of the Negro students dropped out of college during the first year. The percentages of students who dropped out of college from public high schools outside the State, private secondary schools inside the State,

and private secondary schools outside the State were 10.2, 17.6, and 10.3 respectively.

There is a slight overall trend with respect to student-semesters passed in favor of the larger high schools. The overall student-semester passing percentages for the five groups of secondary schools arranged in descending order are as follows:

Public High Schools outside Virginia	91.6%
Public Negro High Schools in Virginia	89.1%
Public White High Schools in Virginia	87.3%
Private Secondary Schools outside Virginia	84.5%
Private Secondary Schools in Virginia	83.2%

For white students the student-semester passing percentages ranged from 99.3 for home economic courses to 79.8 for mathematics courses. The range for Negro students is 100% each in home economics and in religion down to 64.4% for courses in mathematics.

The lowest passing percentage (71.1) for Private Secondary Schools inside the State is in foreign languages, and the highest passing percentage (94.3) for Private Secondary Schools outside the State is in military sciences.

4. Academic Aptitude Testing of Freshmen at Longwood College.

M. Boyd Coyner; *Longwood College.*

For thirty years Freshmen entering Longwood College have been given the *Otis Test of Mental Ability: Higher Examination,* which is considered a fairly good test of academic aptitude. Records of medians and percentiles have been kept. In 1947 the College began a new program of more careful selection of students for admission than had previously been used.

Comparisons of records under the new program with those previous thereto show considerable improvement in the general level of ability to do academic work: about one-fourth of present admissions are below the median score on the Otis Test secured by earlier admissions, and about one-tenth of present admissions are below the Q_3 score of earlier admissions.

As to the validity of the Otis Test, correlation with academic records cluster around +.50. The "Dean's List" for the current semester contains eight times as many from the upper half of the class, as measured by the Otis Test, as from the lower half of the class.

The Otis Test has been administered recently to 75 Sophomores. Correlation with Freshman scores is +.82. The average change in scores is an addition of less than three points, and 72% of the cases changed five points or less. The highest possible score on the test is 75 points.

5. A Study of Certain High School Graduates in Relation to Their Elementary School Origins.

George G. Richards, Jr.; *Weller Baker School, Cambria, Virginia.*

Schools in the Blacksburg Magisterial District of Montgomery County, Virginia provided the data for this study. The Town of Blacksburg and its environs constituted what was deemed to be a typical college community, since it appeared that the educational and cultural life of the Magisterial District was built around Virginia Polytechnic Institute, its Experiment Station, and its Extension Division.

The schools included in this study were the Blacksburg High School and the ten elementary schools from which pupils were promoted to that school. Particular attention was limited to the 86 pupils who were graduated from the High School at the end of the 1950-51 term.

The purpose of this research was to discover what relations, if any, there were between elementary school origins of the students and their ratings in high school. These ratings included grade averages, parents' education, intelligence quotients, co-curricular activities as indicated by membership, co-curricular activities as indicated by office holding, ages, absences, and the A.C.E. Psychological Examination scores.

The data were arranged in four groups, designated according to the several distances of pupils' homes from Blacksburg. The data were also organized in terms of individual schools. Coefficients of correlation of the zero, first, and second orders were computed, as between various traits studied.

Two salient findings, relative to the population under investigation, emerged from this study:

(a) Academic success in high school tended to be determined by native ability rather than by distance travelled.

(b) Participation in co-curricular activities tended to be strongly and adversely affected by such travel.

6. A Study of the Certification of Science Teachers in Virginia.

John B. Chase; *University of Virginia.*

It was the purpose of this study to (1) determine the types of science jobs that are most prevalent in Virginia, (2) ascertain the opinions of school administrators in Virginia about the present certification requirements for science teachers in Virginia, (3) study and compare the basis for certification in those states which have requirements comparable to or higher than those now existing in Virginia ,and (4) make recommendations based upon the conclusions of the study for the improvement of the certification of science teachers in Virginia.

A study of the responses of 114 (91.2%) Virginia superintendents to a questionnaire indicates that the vast majority of science vacancies calls

for certification in at least three of the sciences. In general, state certification requirements do not demand the breadth of training that seems to be desirable. Superintendents feel that a single endorsement for the field of science rather than the present plan of separate endorsements would be desirable. The findings of this study confirm the fact that certification should reflect competence in subject matter; hence, it is recommended that prospective teachers of science should have introductory courses in the three sciences of biology, chemistry, and physics with additional courses totaling at least 24 semester hours in one field and at least 18 semester hours in the others.

The findings and recommendations call for further study of the organization and methodology used in science courses at the college level taken by prospective science teachers. They should be trained and certified to integrate the various sciences and to teach social, economic, and political relationships which exist in scientific development and progress. A constant and closer working relationship between certification agencies and institutions planning programs for the training of teachers of science should exist. Providing sufficient and capable teachers of science requires the best cooperative effort of all concerned – schools of education, departments of science, scientific organizations and state agencies.

7. Developing A Functional Program in Nursery School Education.

Alvia L. Bozeman; *Virginia State College.*

This paper deals with the nursery school at Virginia State College. A brief statement of the history of the nursery school is given. Emphasis, however, is placed upon its contemporary status. The objectives, including research in the field of child development are outlined. The facilities and personnel are given and methods of implementing the program are indicated.

The discussions make it clear that the nursery school is designed to meet the needs recognized as fundamental in the lives of pre-school children. In particular, emphasis is placed upon the prevention of the development of personality abnormalities.

The nursery school serves not only the children, but it also serves as a place where parents may observe their children in a social situation different from that of the home. For students in subject areas concerned with the development of children, it provides a place for observation of the phenomena considered of consequence in the general area of child growth. Its excellent facilities for research are available to persons working in this or related areas.

Testing appropriate for this level is conducted and records of pertinent data are kept and used for a wide variety of purposes consistent with the maximum development of the child and for conferences with parents.

8. Guidance Programs in Virginia Colleges.

W. Donald Clague; *Birdgewater College.*

This study was an attempt to determine the organization and general practices in guidance in the four-year colleges and universities in Virginia, and to compare the findings in these areas with those considered desirable by authorities in the field of guidance. The data were gathered by personal visits to colleges, study of catalogs, use of a questionnaire, and abstraction of other studies.

The following are some of the conclusions and recommendations which resulted from the study and comparison with the literature on guidance;

1. Administrators in Virginia colleges and universities are becoming increasingly guidance conscious. There are some organized guidance services in each of the twenty-one institutions studied.

2. There is need for study and clarification by administrators and guidance personnel of the proper functions of guidance personnel.

3. Both faculty and students are used in guidance in some colleges, but in-service training programs are few, though recognized as helpful.

4. Some form of counseling is avaliable in all the institutions studied; voctional counseling is most often neglected; academic counseling is most often provided.

5. Opportunities for remedial work in reading, etc., are limited though needed. They are being increasingly provided.

6. Adequate vocational placement and follow-up services are not provided in most of the institutions.

7. Systematic evaluation of guidance programs is inadequate in most of the colleges studied.

8. Research activities in the field of guidance are limited and should be expanded.

BUSINESS MEETING

The following officers were elected by the section of Education to serve for the year 1953-1954.

Chairman: Joseph N. Payne
Secretary: John B. Chase, Jr.

MINUTES OF THE SECTION OF ENGINEERING [7]

VICTOR G. SZEBEHELY, *Chairman*
ROBERT W. TRUITT, *Secretary*
NELSON F. MURPHY, *Section Editor* (1953)

FRIDAY, MAY 8, and SATURDAY, MAY 9 — 9:00 A.M. — ROOM 105, NICHOLS ENGINEERING HALL

1. Engineering Aspects of Nuclear Energy.

J. M. Morgan, Jr.; *Virginia Military Institute.*

A brief history is given of the development of nuclear energy from Curie to the present. Structural damage and the reason therefor in the two Japanese target cities, including that done by fire and blast, are described. A discussion is given of (1) some building materials as a shield from radioactivity, (2) increase in size of explosion and the resulting effect on materials, and (3) the disposal of radioactive waste as an engineering problem.

2. Analogies Based upon the Two-Dimensional Poisson's Equation.

James G. McGinley; *Virginia Polytechnic Institute.*

There are various two-dimensional physical phenomena that are governed by the mathematical relationship known as Poisson's Equation. Some of these are (1) the shear stress in a prismatical bar subjected to torsion, (2) pressure under a membrane, (3) the heat flow through a body, and (4) electrical flow in a conductor.

Following proper development, based upon this fundamental relationship between these various fields, a comparison can be made between terms of the related phenomena and an analogy drawn. An outstanding example of this technique is the celebrated membrane-shear stress analogy.

This thesis will attempt to connect as many problems as possible involving Poisson's equation, arriving at the exact term by term correlation between the variables in the various problems.

The objective of this effort will be to relate the fields for which solutions have not as yet been determined to those for which solutions have been obtained. A tabulation of the related terms will enable one to transfer from one field to another by a certain conversion factor.

3. Compatibility of Highway Materials.

Philip L. Melville; *Council of Highway Investigation and Research, University of Virginia.*

It is common practice to consider a number of materials used in construction as being "inert." For instance, in a Portland cement concrete mix the aggregate is designated as the inert part in opposition to the binding medium, commonly described as the active phase. It is well known that from a true chemical-physical point of view no substance can be absolutely inert, and the term is usually employed with a relative meaning. In recent years cases of concrete distintegration have brought to light such phenomena as: high-alkali cement-siliceous aggregate reaction, and the deleterious effect of certain cherts in cement concrete. As a result of these occurrences and similar ones with other highway materials, it is believed that it would be advisable to acknowledge more openly the fact that the so-called inert property of a material is a function of surrounding conditions and especially: temperature, moisture, stress-strain conditions, and surrounding media in which a given body is to be placed.

4. An Analog Unit for Demonstrating Process Control Instruments.

R. M. Hubbard; *University of Virginia.*

A description is given of a pneumatic analog instrument for demonstrating on-off, floating, narrow band proportional, and proportional plus reset control instruments. Both simple and difficult controllable processes are included. The unit is also capable of imposing an arbitrary deviation of the variable to the pneumatic control instruments.

5. Model and Prototype Behavior of Engineering Structures.

D. H. Pletta; *Virginia Polytechnic Institute.*

Since the behavior of even the simplest structures is often quite complex, engineers have had to base their designs on simplified analytical assumptions and experimental investigations. Model tests have saved millions of dollars in construction costs but require careful interpretation because of their three-dimensional nature and because of the effect of their size on the physical properties of materials. Experiments indicate that models follow prototype behavior quite well in the elastic range but appear relatively stronger at ultimate loads. The paper describes several such tests on small reinforced concrete models.

6. A Survey of Various Methods of Analysis of Cantilever-Type Plates.

William A. Nash; *David Taylor Model Basin, Navy Department.*

The problem of the bending of thin cantilever-type plates has attracted the attention of investigators only in compaartively recent years. Problems involving the static deformations of thin rectangular and skew cantilever plates subject to various loadings normal to the middle surface of the plate have been investigated by several methods, mostly of an approximate nature. More recently the problem of combined static torsion and bending of a cantilever plate of variable thickness has been treated by the method of minimum potential energy. Also, the static deformations

and stresses in a thin cantilever plate in the form of a sector and clamped along one edge have been obtained by approximate methods.

The problem of the bending of cantilever plates of finite dimensions is extremely difficult to solve from the standpoint of biharmonic analysis because of the unwieldy boundary conditions. To date, only the single problem of the deflection of a thin square cantilever plate subject to uniform normal pressure has been solved by "exact" methods. In all other analyses recourse has been made to approximate methods of analysis.

In this paper the various approximate methods used to treat these problems are examined and compared from the viewpoint of both practicality of use and also mathematical and physical rigor. A rather complete résumé of existing knowledge regarding strength of cantilever-type plates is given, together with a bibliography.

7. An Engineering Evaluation of the Continuity Method for Predicting the Form and Location of Detached Shock Waves for Two-Dimensional Flow.

Perry W. Hanson, *Virginia Polytechnic Institute.*

The continuity method, formulated by W. E. Moeckel, is a theoretical approximate method for predicting the form and location of detached shock waves. Unfortunately, at the time of the publication of this method very few reliable experimental results for flow over two-dimensional, wedge-type airfoils were available for comparison with the theory. With the advent of new interferometric techniques and shock tubes, a great deal of experimental data for supersonic airfoil shapes in the Mach number range slightly greater than unity is now avaliable.

Use is made of these data to investigate more thoroughly the reliability of the continuity method. Moeckel's formulation of the continuity method for two-dimensional wedge-type airfoils is first presented, and a set of parametric curves similar to those presented by Moeckel, but in a more convenient form, is included for the Mach number range under investigation. The form and location of the detached shock waves are then calculated by the continuity method for conditions for which experimental data is available. The theoretical and experimental shock waves are compared, and the continuity method evaluated for engineering usage.

8. The Two-Dimensional Subsonic Compressible Flow Over a Joukowsky Airfoil.

Y. K. Pien and E. S. Cornette; *Virginia Polytechnic Institute.*

The fundamental equations of fluid motion are non-linear partial differential equations. As yet, a general method for the treatment of non-linear partial differential equations does not exist. There have, however, been advanced two possible methods of attacking the problem of two-dimensional, steady, irrotational, compressible flow, as follows:

(a) to approximate to the exact non-linear equation by linear differential equations (small perturbation theory);

(b) to try to find a transformation of variables which transforms the exact non-linear equations into exact linear equations.

The second of these two methods, when applied to problems of fluid flow, is known as the Hodograph Method.

In the original non-linear equations of motion, the velocity components are the dependent variables, and the coordinates are the independent variables. In the Hodograph transformation these equations are transformed into exact linear differential equations in which the velocity components become the independent variables.

Th. von Karman and H. S. Tsien have shown, by a simplification of the exact linear Hodograph equations, that these equations reduce to the Cauchy-Riemann differential equations. In solving the Cauchy-Riemann differential equations for a compressible fluid, any analytic function may be used as the solution, but the difficulty lies in satisfying the boundary conditions in the physical plane. However, since the equations of motion in the Hodograph plane for an incompressible fluid are of the same mathematical type as those for a compressible fluid, Karman and Tsien have shown that one may use the known solution for the incompressible fluid as the sought solution for the compressible fluid. That is, the Karman-Tsien method allows one to obtain an approximate compressible flow solution by using a known incompressible flow solution.

It is the purpose of this paper to obtain the approximate solution of the compressible flow over a symmetrical Joukowsky airfoil by employing the Hodograph Method in conjunction with the simplification made by Karman and Tsien.

9. Aerodynamic Effects on a Body Immersed in a Non-Uniform Flow.

Joseph L. Hendricks, Jr.; *Virginia Polytechnic Institute.*

The usual theoretical analysis performed to determine the pressure distribution on a body assumes that the flow far ahead of the body is uniform, irrotational, and incompressible. There are cases, however, in which the flow is not uniform. Examples of this condition are the flow behind a wing and the subsonic compressible flow behind a detached shock wave.

This paper, then, is concerned with determining experimentally the pressure distribution resulting from a non-uniform velocity distribution. An expression for the pressure coefficient on a cylinder in a parabolic velocity distribution has been derived by Henry T. Nagamatsu in his doctoral thesis on detached shock waves. The theoretical pressure coefficient will be compared with the pressure coefficient obtained experimentally in the wind tunnel having a predetermined curvilinear velocity distribution. Preliminary investigations indicate that the velocity distribution in the test section can be altered (successively).

A final objective is to determine if there is some unfiorm flow that will cause the same pressure distribution on a cylinder as the non-uniform velocity distribution.

10. Line Coordinate Chart for the Viscosity of Aqueous Glycerin.

Richard E. Herron and D. S. Davis; *Virginia Polytechnic Institute.*

New data, which deal with viscosities of aqueous solutions of glycerin that contain from 9.5% to 95% glycerin at temperatures from 20° to 50° C., are correlated by means of the equation

$$\log \mu = a/(t + 230) + b$$

where μ is the viscosity in centipoises, t is the temperature in degrees centigrade, and a and b depend upon the concentration. A line coordinate chart enables rapid and accurate solution of the equation, provides for easy interpolation along closely graduated scales, and agrees well with a previous nomograph (Davis, D. S., Chem. Eng., 59 [4] 178, 1952).

11. The Effect of Operating Variables on Overhead Vapors and Residues from a Continuous Flash Distillation of Methanol-Water.

Charles E. Littlejohn and Frank C. Vilbrandt; *Virginia Polytechnic Institute.*

The system methanol-water was flash distilled in a nine-inch-diameter electrically heated still, 14 inches high, under a condition of paddle agitation with a hold-up of 445 cubic inches. The vaporizing temperatures were 172°, 166°, and 162° F.; stirrer speeds were zero, 500, 1000, 1500, and 2000 r.p.m.; feed rates were 0.01 to 0.05 pounds per minute.

The fraction vaporized was a function of the feed rate:

$$Z = K_1(R_1 - R_2)^{-b}$$

where Z is the fraction vaporized, K_1 is the fraction vaporized when the term $(R_1 - R_2)$ is equal to one, R_1 is the feed rate in pounds per minute, R_2 is the feed rate when the residue rate is equal to zero, and b is a constant for a given temperature and stirrer speed. Z was directly proportional to stirrer speed and the vaporizing temperature, varying between 1.0 and 0.04.

The composition of the distillate was an exponential function of the feed rate:

$$X_D = K_2(R_1 - R_2)^a$$

where X_D represents the distillation composition, weight percent of methanol, K_2 represents the distillation rate when $(R_1 - R_2)$ equals one, R_2 is the feed rate when the residue rate is equal to one, and a is a constant for a given temperature and stirrer speed.

The expression

$$N = \frac{X_D}{X_S} \times K_2(nt_h)^d$$

for dynamic equilibrium ratios, where X_S is the composition of the liquid in the still at equilibrium as weight percent methanol, n is the stirrer speed in r.p.m., t_h is hold-up time in minutes, and K_2 and d are constants for a given temperature.

12. Design, Construction, and Operation of a Continuous Pilot Plant Hypersorption Unit for Vapor Phase Separation of CS_2 and H_2S.

Seymour S. Stein and Frank C. Vilbrandt; *Virginia Polytechnic Institute.*

The continuous hypersorption unit consists of two major heat transfer sections of 13.42 square feet each separated by adsorption and rectifying sections, the latter consisting of 2 inch standard pipe, 13 feet long. A gas life system was incorporated for recirculating the cargon from the bottom of the unit to the top.

Adsorption activities of 59.40%, 37.01%, 23.56%, 12.89%, and 2.05% were obtained for activated carbon, silica gel, sovaleads, activated alumina, and filtol, respectively, at 30° C. for an air flow rate of 1560 milliletriper minutes. Retentierties of 2.93%, 0.54%, 3.05%, and 3.65% were obtained for activated carbon, sovabeads, activated alumina, and silica gel, respectively, at 30° C. for an air flow rate of 780 milliliters per minute.

Pure isotherms were obtained at 33°, 50°, 75°, 100°, and 140° C. for hydrogen sulfide and at 50°, 75°, 100°, and 140° C. for carbon disulfide, at pressures of 11.4 to 726.0 millimeters of mercury.

The ratio of carbon disulfide to hydrogen sulfide absorbed at a pressure of 760 millimeters of mercury was 4.10, 6.08, 7.88, and 9.30 at temperatures of 50°, 75°, 100°, and 140° C.

13. Operating and Design Variables in Continuous Liquid Thermal Diffusion.

C. Leo Kingrea and Frank C. Vilbrandt; *Virginia Polytechnic Institute.*

Liquid thermal diffusion may be utilized to enrich a desired component in liquid mixtures; typical examples are the separation of isotopes, the separation of azeotropes, and the separation of hydrocarbons.

The effects of operating and design variables on the enrichment of aqueous sugar solutions were investigated experimentally. Variables considered were feed concentration, operating temperatures, feed and draw-off flow rates, length and width of the diffusion annulus, and the location of feed and draw-off ports.

Experiments were made in a concentric tube type apparatus. This apparatus consisted of a cold wall formed by an inner copper tube, through which tap water was circulated. This tube was concentrically enclosed by a glass tube which formed the hot wall of the diffusion annulus, and this pair was then enclosed by a glass pipe. The hot wall of the diffusion chamber was heated by circulating hot water or by condensing steam in the outer annulus between the glass tube and the glass pipe. The sugar solutions were fed into and drawn from the annulus through suitably arranged ports in the coppe rtube. The refractive index change between top and bottom samples was used to indicate the amount of enrichment effected.

14. The Relation of Vessel Diameter to Several Properties of Fluidized Beds of Solid Particles.

John E. Lastovica, Jr. and Fred W. Bull; *Virginia Polytechnic Institute.*

An investigation was performed to determine variations in the important physical characteristics of a fluidized bed of solid particles as the diameter of the fluidization vessel was varied. Six pyrex vessels, each four feet long, having internal diameters of 4-, 2-, 1 15/32-, 1-, 3/4-, and 7/16-inch were used. The solid particles chosen were tabular alumina, ottawa sand, crushed sandstone, silica gel, superbrite glass beads, sovabead fines, and a micro-spheroidal cracking catalyst. The fluidizing medium was air. The amount of bed expansion required to permit fluidization was found to be a constant characteristic of each solid. Fluidization ranges increased with increasing vessel diameter. Critical fluid mass velocities approached a minimum value as the vessel diameter was increased, indicating that critical mass velocity might become independent of vessel size as the vessel diameter reached some value greater than four inches. Important characteristics of the solid particles were determined. An equation, including a vessel diameter term, is presented for predicting critical mass velocities and relating the physical properties of beds fluidized at greater than critical mass velocity.

15. Design, Construction, and Calibration of a Small Supersonic Wind Tunnel.

Fred W. Martin and Robert W. Truitt; *Virginia Polytechnic Institute.*

This paper describes the design, construction, and calibration of a relatively inexpensive, undergraduate, blow-down, supersonic wind tunnel. A detailed description is given of the nozzle and working section, including methods of design analysis. Interesting shock wave photographs, which were obtained by a simple and inexpensive schlieren system, are presented. Experimental data are given and discussed for the calibration, and several simple experiments are described.

16. Stresses from Localized Pressure and Irregular Contours within Thick-Walled Vessels (A Proposed Program).

B. A. Niemeier; *Experiment Incorporated, Richmond.*

The limitations in the application of generally accepted formulae for analyzing stresses and strains within thick-walled vessels are discussed. Fragments of tests on a pressure chamber indicate the need for improved design criteria. A series of tests is proposed for attacking the problem of localized high pressure within thick-walled vessels. An experimental procedure to show the effect of varying the outside and/or the inside diameters is also outlined.

BUSINESS MEETING

The officers elected by the Engineering Section for the year 1953-1954 are the following:

Chairman: Robert W. Truitt.
Secretary: Philip L. Melville.
Section Editor: Robert Hubbard.

MINUTES OF THE SECTION OF GEOLOGY [8]

RAYMOND S. EDMUNDSON, *Chairman*
WAYNE E. MOORE, *Vice-Chairman*
WILLIAM T. PARROTT, *Secretary*
BYRON N. COOPER, *Section Editor* (1953)

FRIDAY, MAY 8, 1953 – 9:00 A. M. – ROOM 249, MALLORY HALL

1. Carolina Bays of the Coastal Plain of Virginia.

Allen Sinnott; *District Geologist, Ground Water Branch, U. S. Geological Survey, Charlottesville.*

Examination of photo-index mosaics of aerial photographs taken on the Eastern Shore peninsula in Virginia reveals many oriented, elliptical, shallow depressions with low sand rims – typical examples of the Carolina Bays described from the eastern part of the Carolinas and elsewhere in the Atlantic Coastal Plain from Florida to New Jersey. Prouty's modified meteoric hypothesis of origin is favored. In order to test this hypothesis, magnetometer surveys, and chemical analyses of soils to detect significant traces of nickel, are planned.

2. New Concept of Appalachian Thrust Faults.

Wilbur A. Nelson; *University of Virginia.*

Geological work carried on in Smyth and Washington Counties, Virginia, along the Saltville Fault, supplemented by diamond drilling, has shown the presence of a normal fault near the northwest side of the Saltville Valley, dipping approximately sixty degrees to the southeast and located from 150 to 500 feet northwest of the trace of the Saltville Fault. Drilling was also done for a distance of two miles to the southeast of the trace of the Saltville Fault and this drilling showed that 100 or more feet southwestward from the trace of the fault, where the fault plane has a dip of approximately sixty degrees, that this dip of the surface beds decreased very quickly to 40-35-30 and finally to the magnitude of 20 to 15 degrees and maintained this dip for several miles. This drilling disclosed the fact that the Saltville Fault was a bedding plane fault, the thrust being carried by the Honaker dolomite and that the MacCrady formation was below the thrust fault for this entire distance. A cross section of the Saltville Valley at the dip of the Saltville Fault, and the normal fault near the northwest side of the valley, brought out strikingly the fact that a downward displacement of the rocks on the southeast side of the normal fault would account for an upward drag of the Saltville fault plane,

resulting in the high dip of the Honaker dolomite which forms the hanging wall of the fault.

It is felt that wherever a thrust fault outcrop shows dips of sixty degrees or more, that this abnormally high dip can best be accounted for by the presence of a normal fault a few hundred feet north, or northwest, of the outcrop of the thrust fault, particularly if the dip of the rocks in the thrust fault block flatten out to approximately twenty degrees within several hundred feet of the fault trace.

This is the new concept of Appalachian Thrust Faults advanced by the author.

3. Concerning the Influence of Meg. B-8, an East-West Zone of Crustal Megashearing.

B. Ashton Keith; *Department of Geology, Institute of Sciences, Washington, D. C.*

This paper summarizes voluminous evidence indicating the presence of a long and comparatively narrow zone of moderate crustal shearing. In particualr its trend is marked by numerous evidences of deep crustal penetrations that are roughly in-line across the southern parts of this and eight other states. Mathematical calculations on the possible distortional effects of the centrifugal force caused by Earth's rotation and on the forces of Coiroli calculated for the 37th parallel of latitude definitely indicate the probability of differential movements in the rocks, and with axial trends very nearly like many actually found in nature within this belt. More than two hundred indications of crustal penetration have been found including igneous plugs, necks, dikes and lava-flows, at least four cryptovolcanoes, more than seventy diatremes, two recognized laccoliths and more than one hundred reported igneous intrusions.

Using production figures from official sources, it is shown that the grand total production of mines within this zone exceeds $100,000,000 per year for gold, silver, copper, lead and zinc only; while the total values for petroleum and natural gas produced each year vastly exceed that figure. An interesting comparison is made of the average annual productions per square mile with those of the rest of this United States, and with those of a similar belt next adjacent on the south, but with far fewer indications of crustal penetration or of disturbances in the strata.

4. The Stratigraphy of the Broadford Sandstone and Superjacent Marine Strata in Southwestern Virginia.

Lynn Glover; *Virginia Polytechnic Institute.*

A detailed study has been made of the succession of strata embracing the Devonian-Mississippian boundary in southwestern Virginia. The stratigraphic and faunal information obtained indicates the necessity of recognizing significant changes in age assignment and nomenclature of the units involved. Seven sections were measured in the belts of outcrop

extending from the vicinity of Blacksburg, Montgomery County, to Broadford, Smyth County, Virginia. Fossils were collected from all of these sections.

The Broadford sandstone at its type locality is not of Osagean age as Reger thought. Unfortunately the type section seems to be barren of fossils. By the use of stratigraphic position, and key beds, the Broadford sandstone has been located in all of the six sections measured to the northeast of Broadford, and in each a Coneango fauna consisting of representatives of the genera *Cyrtospirifer, Schuchertella, Mytilarca,* and others has been found. Generally the real Broadford sandstone in Virginia has been mapped as part of the "Chemung formation," and younger Mississippian units have been mistakenly identified as the Broadford sandstone.

Rusty weathering, flaggy, marine sandstones and shales overlie the Devonian Broadford sandstone, and are terminated by the Cloyd member of the Mississippian Price formation. This unit contains *Camarotoechia, Chonetes, Allorhynchus,* and *Pseudoxyrinx.* The succession is tentatively recognized as a separate formation, and on the basis of its early Mississippian fauna.

5. Silurian Formations of Southwest Virginia.

Ralph L. Miller and Leonard D. Harris; *U. S. Geological Survey.*
(Presented by Ralph L. Miller)

In Lee County and western Scott County, Virginia, the Silurian rocks have consistently been divided into three formations. These are in order upward the Clinch sandstone, the Clinton formation, and the Hancock dolomite (called Cayuga by some geologists). Although these formations are in general readily distinguishable from each other, their mapped and described contacts have not in the past been consistently interpreted. The Clinch sandstone contains a basal shale member that appears to be everywhere present along the Silurian belts of Poor Valley Ridge, Wallen Ridge, and Powell Mountain. The base of the Silurian and of the Clinch sandstone has commonly and erroneously been placed at the top of this shale member rather than at its base, where the prominent disconformity lies. The contact between Clinch sandstone and Clinton formation is also marked by a disconformity very close above which are found fossiliferous sandstone and red shale containing abundant *Geolospira hemispherica.* This contact also has tended to wander as described in stratigraphic sections and shown on geologic maps of Lee and Scott Counties. The Hancock dolomite of southwest and central Lee Counties grades northeastward and eastward into a more limy and sandy facies. The lithologic term dolomite as applied to the Hancock by Miller, Fuller, and Brosgé is not applicable in Scott County or Wise County.

6. Evidence of Turbidity Currents in the Lynchburg Formation.

Edwin O. Gooch; *Virginia Geological Survey.*

Fragments of shale and other fine-grained sediments occur in massive,

coarse-grained beds of the Lynchburg formation in Madison, Culpeper, and Rappahannock counties, Virginia. These fragments, many of which show bedding and resemble the fine-grained beds of the Lynchburg and thus are probably intraformational in origin, are very irregular in size and shape. The edges of these fragments are, for the most part, sharp and angular and show little of the smoothness or roundness that would be expected as a result of stream transportation. However, well-rounded pebbles are associated with these fragments. This association, as well as the occurrence of the fragments and pebbles in otherwise well-graded sediments, seems incomparable—for sediments transported by streams and deposited under normal conditions of sedimentation.

In view of recent studies by Kuenen and Migliorini on turbidity currents as agents of transportation and deposition, and the characteristics of sediments thus formed, it is believed that the sediments under consideration were transported and deposited by such currents.

7. Mineralogical Studies of Sediments of the Nottoway River, Virginia.

Alden M. Pitard, Daniel E. Popovich, William V. Trollinger, and Henry D. Wagener; *Washington and Lee University.* (Presented by Alden M. Pitard.)

In a microscopic study of the heavy minerals of the Nottoway River, certain definite correlations were found to exist between the minerals in the samples and the parent rock forming the river bed. Biotite was derived from the Petersburg Granite, and garnet from the Red Oak Granite. The Aporhyolite formation contributed large quantities of epidote and hornblende. Zircon, muscovite, and rutile were all taken from the Wissahickon Granitized Gneiss formation. The samples used in this study were obtained and processed by the usual procedures employed in sedimentary petrography.

8. An Occurrence of Oolitic Chert in Rockbridge County, Virginia.

Perrin Walker; *University of Virginia.* (Introduced by R. S. Edmundson)

A blue-black, lenticular, oolitic chert occurs in a six inch sandstone bed lying between two beds of Conococheague dolomite, which outcrop on the first ridge south of Buffalo Creek along U. S. Route 11, approximately eleven miles south of Lexington, Virginia. The chert was formed from the precipitation of colloidal ferrous iron and silica; and, as colloidal matter coagulates in globular units, oolitic structure was formed. The oolites may be banded concentrically and contain either: (1) a back iron center; (2) a clear silica center, or (3) a quartz grain center. Geodic structures lie in the central section of lenses and show two distinct crystallization bands. They represent the last liquids of dehydration within the gel. Some parts of the main silica mass, geodes and oolites go to extinction under crossed nicols, showing crystalline quartz. A cyanide test was posi-

tive for ferrous iron only after 48 hours. This reaction time-lapse substantiates colloidal precipitation, although X-ray powder photographs with Cu radiation show crystal structure. Coloidal silica is known to convert to crystalline quartz at temperatures above 200° C, and the crystal structure appearing on X-ray photographs has been determined as alpha quartz (3.35; 4.26; 1.37).

9. Residual Sands and Erosion Surfaces of Western Virginia.

W. D. Lowry; *Virginia Polytechnic Institute.*

Residual quartz sand deposits, several of which are commercial, occur at a number of localities in western Virginia. The deposits were formed by intensive weathering of quartzitic sandstones ranging in age from early Cambrian to Mississippian. They are erosional remants of formerly more extentsive soil profiles and their preservation is related to their favorable location near drainage divides. The elevation of the deposits ranges from 925 feet to 3750 feet. The two highest deposits are on or near relatively stable major drainage divides which represent remnants of the surface produced by the Schooley erosion cycle—an extensive to middle Cretaceous time of the Fall Zone cycle. Most deposits are approximately 2400 in elevation and are on the slopes of divides. They represent remnants of an extensive soil profile developed during the Harrisonburg erosion cycle. This cycle of Virginia's Atlantic slope streams began in middle Cretaceous time and ended in Oligocene time. The approximately 1500-foot difference in elevation of the Schooley and Harrisburg surfaces in western Virginia is the result of differential uplift of the Appalachians with the Fall Line serving as a pivotal axis. The duration of the Harrisburg cycle is estimated by the amount of downward tilting of the marine sediments of the Coastal Plain. The ensuing Piedmont erosion cycle was terminated with the withdrawal of the Miocene sea which initiated the present cycle. The active erosion of the present cycle is in part due to an increase in the gradients of major streams resulting from eustatic lowering of sea level during Pleistocene time.

10. Mineralogical Studies of Sediments of the Smith River, Virginia.

G. M. Young, R. F. Bee, and J. R. Kean; *Washington and Lee University.* (Presented by G. M. Young.)

This is a paper written in conjunction with curricular activities at Washington and Lee for the purpose of studying the stream sediments for heavy mineral distribution of the Smith River drainage basin of Southwest Virginia. Further, the study includes investigation for correlation of the sands as to probable mineral derivation.

Heavy minerals found in Patrick, Henry, and Franklin counties were: Biotite, Diopside, Epidote, Hornblende, Illmenite and Magnetite, Kyanite, Muscovite, Rutile, Sillimanite, Staurolite, Titanite, Tourmaline, and Zir-

con. Hornblende, Illmenite and Magnetite were found as the most abundant, with Kyanite and Zircon generally common.

Only two good correlations were found. Titanite apparently is derived from the Garnetiferous Biotite Schist of the Wissahickon Schist. Sillimanite is probably derived from local conditions in the Wissahickon schist. All other minerals originate in Lynchburg Gneiss or Hornblende Gabbro Schist.

11. Lithologic Variations in the Upper One-third of the Beekmantown Formation along Cub Run Creek.

Robert M. Cordova and George S. Meadors; *University of Virginia.* (Presented by George S. Meadors.) (Introduced by R. S. Edmundson.)

This paper presents observations in the Beekmantown limestone and dolomite along Cub Run Creek, about five miles north of Shenandoah, Virginia, on U. S. Route 12.

The method of study is based on field observation, etching, staining, and petrographic thinsections.

In general, the upper third of the Beekmantown is a light grey to blue, slightly cherty, fine-grained limestone and magnesium limestone interbedded with dolomite. Three elliptical dolomite masses were noted and detailed work was done on the largest of these in order to draw conclusions as to origin. This largest dolomite mass contains several rectangular to square-shaped limestone blocks which are orientated at random and the largest being ten by twenty inches in size. The dolomite mass makes a very sharp contact with the surrounding limestone, and also contains an intraformational conglomerate with limestone pebbles having a range of one-fourth to three-fourths inches in size. Due to the fineness and the anhedral shape of the dolomite grains, the writers concluded that this mass had been chemically precipitated in a cave or tunnel. This precipitation proceeded slowly, gradually forming an ooze into which the limestone blocks fell. The occurrence of the intra-formational conglomerate around the lower periphery of the dolomite mass is indicative of movement causing the adjoining limestone to be torn away, forming a conglomerate.

12. Early Paleozoic Structure in Southwestern Virginia.

Wayne E. Moore; *Virginia Polytechnic Institute.*

Expanding stratigraphic studies in southwestern Virginia are revealing isopach, lithofacies, and unconformity patterns which indicate the existence of gentle warps that originated as early as the Canadian. Preliminary results suggest that biofacies also indicate the pressure of these early warps. Although the crests of the anticlinal warps appear to have shifted from time to time, definite areas remained structurally high throughout all, or much, of the Paleozoic.

An early Paleozoic anticlinal wrap of the type described exists in the Washington-Russell County area of Virginia. The gentle nature and pattern of these warps appear to be similar to those existing in the Gulf Coastal Plain Province.

13. Mineralogical Studies of the Sediments of the Meherrin River.

J. L. Hinkle, E. K. Haight, J. C. Rich, and J. A. Sites; *Washington and Lee University.* (Presented by J. L. Hinkle.)

A total of sixteen samples of sand were collected from the Meherrin River starting near the source in Lunenburg County, Virginia, and continuing to a point near the North Carolina border. The methods used to separate the heavy minerals from the sand were the ones usually used in sedimentry Petrology. The twelve minerals that composed the first sample were found to be present in the remaining samples. This similarity of composition is no doubt due to the similarity of the Pre-Cambrian gneisses and granites from which the river derives its sediment.

14. Mineralogy of the Clay Fraction of Some Piedmont Soils.

James L. Eades; *Council of Highway Research and Investigation, University of Virginia.*

The −5 micron portion of several diversified soils were separated by sedimentation fractionation. The −5 micron portion was subdivided further into smaller particle sizes (−5 mic. to 2, −2 mic. to 1 mic., −1 mic. to .2 mic., and everything below −.2 mic.), in two of the soils for the purpose of trying to determine the portion best suited for x-ray analysis. Physical properties were evaluaed on the original −40 sample. The −1 micron portion was analyzed for clay mineral identity by x-ray diffraction. These data were collected to study the relationship of clay minerals to the parent material.

15. Paragenesis of Mineralization in the Climax Molybdenum Deposit, Colorado.

Charles E. Sears, Jr.; *Virginia Polytechnic Institute.*

The Climax molybdenum deposit is located at Climax high in the Front Range in northeastern Lake County, Colorado. The country rock in the mineralized area is the Idaho Springs formation and the Silver Plume granite which has intruded and partially assimilated the Idaho Springs formation; both are of Pre-Cambrian age. Tertiary dikes and sills ranging in composition from quartz porphyries to quartz monzonite porphyries intrude the older rock. Extensive hydrothermal alteration has altered the country rock resulting in silicification, argillization, sericitization, and topazization. The mineral sequence is pyrite, chalcopyrite, wolframite and cassiterite; molybdenite; wolframite and cassiterite, topaz; rhodochrosite, galena and spalerite. Monozite occurs along with the cassiterite and is especially abundant in high sericitized zones.

16. Geologic Section Across Western Floyd County, Virginia.

Richard V. Dietrich; *Virginia Polytechnic Institute.*

Floyd County is one of the three areas indicated on the Geologic Map of Virginia (1928) as "Undifferentiated pre-Cambrian rocks." This is a report of progress in the geologic mapping of the county.

Western Floyd County is in the highly dissected Blue Ridge Plateau. It is drained by tributaries of the New River.

Nearly all prominent S-planes in the rocks of western Floyd County have a northeast strike and a moderate southeastward dip. A generalized geologic section from the Pulaski County line on the north to the Patrick County line on the south, taken approximately perpendicular to the regional strike is:

Lower Cambrian quartzites and arenites
—(Mylonitized fault zone)—
Augen gneiss with intercalated phyllites and "pyroxenites"
Phyllite (locally graphite-bearing)
Gneissic muscovitic and biotitic quartzite with included metagabbros
Amphibolite
Gneissic graphitic-muscovitic quartzite

The following questions are considered: Are the Blue Ridge metamorphic rocks of pre-Cambrian age? Are these metamorphosed volcanics in the western Blue Ridge? What is the origin of the "pyroxenites"? Is the "Lovingston granodiorite" of igneous origin? Do the great apparent thicknesses of some of the units reflect isoclinal folding? Are some of the "thrust faults" unconformities? When did mineralization occur with respect to the tectonism?

17. Geology of the Iron Deposits at the Riverside Mine near Alvarado, Washington County, Virginia.

Byron N. Cooper and William E. Diggs; *Virginia Polytechnic Institute.* (Presented by William E. Diggs.)

The iron deposits at the old Riverside Mine near Alvarado, Washington County, Virginia, are typical of the so-called limestone magnetite deposits of the Appalachian Valley in Virginia and northeastern Tennessee. Most of the iron occurs in the form of sulphides, carbonates, and oxides which fill irregular interstices in a limestone-dolomite-chert breccia, a substantial part of which is believed to represent a sinkhole-filling in the upper 350 feet of the Knox dolomite. Following post-Canadian emergence and erosion, the sinkholes developed on the Knox were inundated by the fetid waters of the Liberty Hall sea. Iron chiefly in the form of marcasite was precipitated in the open spaces between the blocks composing the sink-

hole-filling. Possibly some of the iron was deposited as carbonate, but part of the iron carbonate minerals and probably all of the oxides, including magnetic hematite, were formed long after introduction of the iron in the sulphide form. Locally, there is a thin gossan cap of spongy limonite. The mineralization at the Riverside Mine is very localized. There are a number of geologically similar deposits within a few miles, but none is so well exposed. The "magnetite" that has been reported from these bodies is actually a magnetic variety of massive hematite.

18. Trilobites from the Lower Champlainian Formations in the Appalachian Valley.

Byron N. Cooper; *Virginia Polytechnic Institute.*

Forty-five species of lower Middle Ordovician trilobites, including six new genera and thirty new species, are described and illustrated from the extensive collections in the United States National Museum. Most of these species occur in beds whose age and correlation have been a matter of controversy for more than a decade. The stratigraphic evidence afforded by the trilobites lends strong support to regional stratigraphic interpretations of the lower Champlainian beds in the Appalachian Valley, which have been worked out by G. Arthur Cooper and the writer from detailed study of brachiopod faunas and from physical stratigraphic studies. The trilobites, like the brachiopods, are not so restricted in their facies distribution as are many groups of invertebrate fossils. Hence, they are very useful in establishing contemporaneity of dissimilar facies. In this paper only the more common trilobites are described. The principal purpose of this study is to make available for bio-stratigraphic use a number of trilobite species, most of which have been confused or misidentified previously.

19. Outline of the Geology of Poor Mountain, Roanoke and Floyd Counties, Virginia.

T. E. Shufflebarger; *Virginia Polytechnic Institute.*

The bedrock of Poor Mountain constitutes an allochthonous block in the Blue Ridge fault system and is composed of the three principal formations of the Chilhowee group. Rocks of the Unicoi formation, Hampton shale, and Erwin quartzite are discussed. A lava flow and associate diabasic rock in the Unicoi formation are assigned to basal Cambrian age and represent eruptive and source-vent materials respectively.

Intricate flexures and large drag folds are the result of low-angle faulting which has thrust basal Unicoi rocks over upon the Rome formation.

20. Subsurface Reconnaissance by the Electrical Resistivity Method.

John P. Meador; *Virginia Department of Highways.* (Presented by W. T. Parrott; Virginia Department of Highways.)

This paper deals with the experience of the Virginia Department of Highways's use of the electrical resistivity unit for sub-surface investigations. The theory of resistivity is briefly discussed with a case history of eight miles of new location which was mapped using the unit. It is concluded that the unit is most useful for location and design work over new locations for the purpose of classifying soil and rock excavation. A detailed knowledge of the geologic conditions in the area mapped is essential. It is desirable that several check holes be put down in the area for the purpose of correlation.

21. Some Current Activities and Projects of the State Geological Survey. William M. McGill; *Virginia Geological Survey.*

A brief account of activities and projects of the Virginia Geological Survey during the current fiscal year (July 1, 1952-June 30, 1953), including projects of the State Survey and the United States Geological Survey. Listed are projects on which field work is in progress; projects on which field work has been completed and reports thereon in preparation; completed projects on which reports are now in process of being printed and projects on which reports are being edited and prepared for printing within the next few months; and ground-water investigations in progress, as cooperative projects between the State and Federal Surveys. New quadrangle topographic maps, issued since June 1952, and quadrangles in which work is in progress are also listed. The status of topographic mapping in Virginia is illustrated on a Progress Map.

FIELD TRIP — MAY 9, 1953

Sixteen cars and forty people left the V.M.I. parade grounds at 8:30 for the annual field trip of the Geology Section. Stop number one was on U. S. Route 60 at the basal conglomerate near the crest of the Blue Ridge. Stop number two was at Humphreys Gap where Unakite was examined. The next stop was on the Bunker Hill Trail near the Lynchburg Reservoir. Here Messrs. Charles Burford and Lewis Hite of Buena Vista located a deposit of allanite by means of Geiger counters. An occurrence of graphite was also examined. The party returned to Humphreys Gap and continued northward along the Blue Ridge Parkway. Stops were made at Boston Knob for lunch, at contact of Cambrian and Pre-Cambrian, and at a large dike enroute to the tin mine at Irish Creek. At this last stop the group examined the mill and dumps of the old mine and collected specimens of the many minerals available. Members of the group went their respective ways at 3:30. Much of the success of the trip was due to Ranger Raymond L. Ives and Naturalist William G. Lord of the U. S. National Park Service.

BUSINESS MEETING

At the close of the technical session, which had about sixty people in

attendance, the nominating committee presented the following slate of officers:

Chairman: Wayne E. Moore
Vice-chairman: William T. Harnsberger
Secretary: Marcellus H. Stow
Section Editor: W. D. Lowry.

There were no further nominations from the floor, and the candidates nominated by the committees were unanimously elected. Information concerning the field trip on Saturday was presented by Marcellus H. Stow.

MINUTES OF THE SECTION OF MEDICAL SCIENCES [9]

E. G. HUF, *Chairman*

D. H. R. GOURLEY, *Secretary*

WILLIAM BICKERS, *Section Editor* (1953)

FRIDAY, MAY 8 – 10:30 A. M. – ROOM 442, MALLORY HALL

1. **Effect of Insulin on the Oxygen Consumption of Intact Skeletal Muscle *in vitro*.**

D. R. H. Gourley; *Department of Pharmacology, University of Virginia Medical School.*

Two effects of insulin have been demonstrated in a single tissue, the intact isolated *extensor digitorum longus* muscle of the rat. The first effect of insulin is to stimulate the rate of oxygen consumption but this is not observed if a substrate such as lactate, pyruvate or glucose is also present. The second effect of insulin is to increase the rate of glucose utilization and glycogen deposition in the muscle. This effect is only observed in the presence of glucose. Thus the insulin effect on the oxygen consumption of the extensor muscle and the effect on the glycogen deposition occur under different experimental conditions. It is therefore tentatively concluded that the two effects are independent phenomena.

2. The Influence of Low Protein Diet on the Distribution of Amino Acid Oxidases in Rats.

C. Hoch-Ligeti; *Department of Pathology, University of Virginia Medical School.*

In connection with experiments on the influence of nutrition on the development of hepatic tumors, the effect of nutritional factors on the amino acid oxidases was studied.

Wistar rats were divided into three groups: (a) on low protein diet, (b) low protein diet with the addition of alpha estradiol (5 γ daily), (c) on a full diet. In the rat, amino acid oxidases are present in appreciable quantities only in livers and in kidneys. The d. amino acid oxidase was determined by measuring the oxygen uptake of liver or kidney homogenates in the presence of d. l. alanine or d. aspartic acid as substrate by the Warburg technique.

In the livers of both groups of rats on low protein diet, the amino acid oxidase levels dropped to half of that of rats on a full diet. The levels of the kidneys were the same in all three groups. In view of the role of the liver in protein metabolism, the finding that, on reduction

of dietary proteins, a decrease of the amino acid oxidase occurred in livers only, might be of physiological importance.

3. Autonomic Responses from the Cortex of the Dog.

H. G. Langford, M. Bernhaut, and E. C. Hoff; *Department of Neurological Science, Medical College of Virginia.*

While the autonomic responses of the cortex of the cat have been well studied, the references to the dog are scattered and conflicting. The first series of dogs were done using nembutal anesthesia, 25 mgm./Kgm. Trachotomy was done, the animal was maintained on positive pressure breathing, the femoral artery was cannulated, and craniotomy was performed. Blood pressure was recorded using a sylphon bellows manometer. Curare was given as needed to block skeletal movement. The cortex was stimulated with bipolar electrodes.

This series of animals gave either no response or depressor responses from the anterior and posterior sigmoid gyri. Towards the rostral end of the cortex pressor responses were obtained which were of 20-30 mm.Hg amplitude. These were obtained 6-7 hours after the experiment started, as this region was reached late in the experiment.

As these responses were different from those obtained in the cat using ether anesthesia, the next series of experiments was done using ether and curare anesthesia.

Here the great majority of these responses were pressor, from the posterior sigmoid to the tip of the frontal cortex. They differed from the cat in frequently lasting for 90-120 seconds, instead of 20 seconds, in the cat.

4. The Role of Epinephrine in Ether Hyperglycemia.

D. T. Watts; *Department of Pharmacology, University of Virginia Medical School.*

Much indirect evidence has been published indicating that hyperglycemia characteristic of ether anesthesia is due to the release of epinephrine and mobilization of liver glycogen. Assay methods have not been sufficiently sensitive to demonstrate increases of epinephrine in the general circulation during ether anesthesia. In the present experiments the extremely sensitive bioassay method of Gaddum and Lembeck (Brit. J. Pharm. 4:401, 1949) based on the inhibition of the isolated rat uterus by epinephrine has been used to estimate the epinephrine content of rabbit plasma before and during ether anesthesia. Blood samples were obtained by cardiac puncture as follows: (a) before anesthesia, (b) at the end of induction of surgical anesthesia, (c) after 30 minutes surgical anesthesia. The epinephrine content of plasma from these samples was found to be (millimicrograms/cc. plasma $\pm$ standard error for 13 rabbits) 3.7 ± 1.1; 6.8 ± 1.6 and 11.6 ± 2.9 respectively. These increases in the epinephrine content of the circulating blood over the preanesthetic level are

statistically significant. Current experiments indicate that acute hypertensive episodes in the dog during ether anesthesia are accompanied by marked increase in the epinephrine content of the circulating blood.

5. Synthesis and Metabolism of N^{15}-labeled Ethanolamine.

Lynn D. Abbott, Jr. and Jack D. Klingman; *Department of Biochemistry, Medical College of Virginia.*

Information regarding the rate and extent of conversion of ethanolamine nitrogen to urea is not available. Data on the nitrogenous metabolism of ethanolamine may aid in understanding its intermediary metabolism. This problem can be studied with isotopically labeled ethanolamine.

We have developed an improved synthesis of ethanolamine for the purpose of preparing the N^{15}-labeled compound. N^{15}-Potassium phthalimide was condensed with *beta*-chloroethylacetate in dimethylformamide. The resulting substituted phthalimide was isolated and hydrolysed by boiling with 20% HCl. N^{15}-Ethanolamine hydrochloride was isolated in good yield.

The excretion of N^{15} in urinary nitrogen and urea, and in fecal nitrogen, was determined after oral administration of single doses of N^{15}-labeled ethanolamine hydrochloride to rabbits. The compound contained 32 atom % N^{15} and was given in an amount containing 2 meq. N^{15}. The first day's urine was collected in 2 periods, the first 6 hours after administration and the following 18 hours. Excretion in 24 hour periods was then followed for 2 weeks. Urine was analysed for nitrogen, urea, ammonia and creatinine. N^{15} analyses were made on total nitrogen and on urea isolated as the xanthydrol derivative. Fecal nitrogen and N^{15} were determined daily for the first week and then in 4 day periods. The data indicated a very rapid and extensive conversion of ethanolamine nitrogen to urea. On a comparatively high nitrogen diet as much as 40% of the administered N^{15} was excreted in this form in the first day, and with a rabbit on a lower nitrogen intake, 34%. The excretion was more rapid and greater than we have found after administration of a comparable dose of N^{15}-glycine under similar circumstances. This may be interpreted as evidence of early deamination and conversion to urea without intermediate glycine formation.

6. The Ionization Constants of Thyroxine and Related Compounds.

Chalmers L. Gemmill; *Department of Pharmacology, University of Virginia Medical School.*

By using long cells in the Beckman Spectrophotometer, absorption spectra in the ultraviolet of solutions of 2.1×10^{-6} M of DL-thyroxine, 3,5-diiodo-L-tyrosine, DL-thyronine, 3,5-diiodo-DL-thyronine, and 3′,3,5-triiodo-L-thyronine were studied in acid, base and at an intermediate pH. From these determinations, the apparent ionization constants (pK′) of the hydroxyl group in these compounds were calculated. The pK′ of

this group in thyroxine (6.71) approximated the pK′ of diiodotyrosine (6.56), the pK′ of triiodothyronine (8.39) was comparable to that of monoiodotyrosine (8.2) while the pK′ of thyronine (10.28) and of 3,5-diiodothyronine (10.17) were comparable to the pK′ of tyrosine (10.05). The value of the pK′ of monoiodotyrosine was obtained from Herriott (J. Gen. Physiol., *31*, 19, (1947-48) and for tyrosine from Crammer and Neuberger (B. J., *37*, 302, 1943). In this work, the maxima of the absorption spectra of these compounds was obtained in acid and base. It was found that the two iodines in the 3′ and 5′ positions contribute greatly to the intense absorption for thyroxine at 325 mu., while the presence of one iodine in the 3′ position causes the absorption of triiodothyronine to occupy on intermediate position between thyronine and thyroxine in the acid as well as in the basic solutions.

7. Effects of ATP Complexes on P^{32} Uptake by Rabbit Erythrocytes.

H. Jonas; *Department of Pharmacology, University of Virginia Medical School.*

Previous investigations of this department have demonstrated intracellular equilibria of human erythrocytes between orthophosphate, ATP, and phosphorylated metabolites. These internal concentrations were also in equilibrium with extracellular orthophosphate, which surpassed intracellular phosphate forms, indicating phosphate adsorption on the cell membrane. This report gives further evidence that added orthophosphate and ATP are taken up by rabbit erythrocytes by adsorption and subsequent absorption. Rabbit blood was obtained by cardiac puncture with heparin and then incubated for 3 hrs. with concentration series of P^{32}, ATP, and Mg^{++}. The blood was centrifuged after chilling, and P^{32} activity measured from plasma aliquots. The cells removed P^{32} from the plasma from extracellular concentrations of less than 10^{-7} moles P^{32}/ml red cells (according to a Freundlich adsorption isotherm). Further P^{32} uptake was by absorption, which reached saturation at about 5×10^{-5} moles P^{32}/ml red cells. Higher concentrations caused hemolysis. Spot checks on the effects of ATP on P^{32} uptake were inconclusive. But additions of various amounts of Mg^{++} to 10^{-8} moles of P^{32} and of ATP/ml red cells showed a strong reduction of P^{32} uptake at equimolarity. Inhibition could be removed by doubling the phosphate supply. Apparently ATP and Mg combine to form a surface complex in competition with phosphate. Addition of various amounts of Mg^{++} to 10^{-9} moles P^{32}/ml erythrocytes in the presence of 10^{-17} moles ATP/ml cells demonstrated some decrease of phosphate uptake at equimolarity of Mg^{++} and phosphate. Magnesium charges may be visualized to compete partially with positive surfaces of $-NH^{+}_{3}$ groups and to reduce the molarity of orthophosphate ions.

8. Effect of the Intravenous Administration of Paritol-C′ on the Serum Lipids of Hypercholesterolemic Rabbits.

J. C. Forbes and O. M. Petterson; *Department of Biochemistry, Medical College of Virginia.*

Previous work from our laboratory showed that rabbits fed a 0.5 per cent cholesterol diet developed not only a state of hypercholesterolemia, but also most of the cholesterol was in a state from which it could be extracted from lyophilized serum by cold chloroform. This is in contradistinction to the results of a similar extraction of lyophilized serum from normal rabbits. In the latter only a small percentage of the total cholesterol is thus extracted while the extraction is usually over 90 per cent in the former. It has now been found that the intravenous injection of 5-10 mg. of the heparinoid, Paritol-C, per pound of body weight into such hypercholesterolemic rabbits caused a marked drop in the various cholesterol fractions. The percentage drop in the fraction which is extracted by cold chloroform in a 3-hour period – the "readily extractable" cholesterol – was usually greater than the drop in total cholesterol. The difference was especially pronounced when the total serum cholesterol had dropped to 700 mg. per cent or lower. The changes in the serum phospholipid and neutral fat content closely paralleled those of total cholesterol. Intravenous administration of Dicumarol was without effect on any of the fractions studied.

9. A Histochemical Study of the Lipids of the Corpus Luteum of Pregnancy in the Water Snake, *Natrix sipedon sipedon.*

Douglas E. Bragdon; *Department of Anatomy, University of Virginia Medical School.*

Progesterone is present in the plasma of non-pregnant female water snakes. During pregnancy it is present in increased amounts and from the small series of animals studied, appears to increase during pregnancy, reaching its highest titer at full term.

Frozen sections of formalin fixed corpora lutea from different stages of pregnancy were subjected to Sudan staining for total lipids, the Schiff plasmal reaction, the Schultz test for cholesterol and examination for birefringence under the polarizing microscope.

In early pregnancy the cytoplasm of the granulosal cells contains small to medium sized lipid droplets which are sudanophilic, Schiff and Schultz positive, and acetone soluble. In chilled sections, numerous small birefringent crystals can be seen. As pregnancy advances, the sudanophilia and the amount of Schiff and Schultz positive material decreases and the birefringent crystals become fewer and coarser.

The lipids of corpora lutea in the second trimester were unresponsive to mammalian LH and prolactin given on alternate days for three doses, the corpora lutea being excised on the second day after the last injection. Although the gradual decrease in lipids may indicate a continued utilization of previously stored cholesterol for progesterone production, the decrease in granulosal cell size and nuclear volume such as occur here are generally indications of lessened activity.

10. Effect of Repeated Administration of Alcohol on Guinea Pigs on a Scorbutogenic Diet.

J. C. Forbes and G. M. Duncan; *Department of Biochemistry, Medical College of Virginia, and the Division of Alcohol Studies and Rehabilitation, Department of Health, Richmond.*

Our former work has shown that a single acute intoxication of rats and guinea pigs caused a marked reduction in the concentration of cholesterol and ascorbic acid in the adrenal glands. We wished to determine whether repeated intoxication would increase the rate of depletion of cholesterol and ascorbic acid in the adrenal of guinea pigs on a scorbutogenic diet and thus accelerate the development of scurvy. Intraperitoneal injection of 4 gm. of alcohol per kg. of body weight as a 10 per cent solution on alternate days 3 times each week did not accelerate the rate of development of the scorbutic condition over pair-fed controls receiving glucose only. After 6 weeks, 7 of 15 receiving alcohol were dead, 1 was moribund; in the control group 6 of 18 were dead and 5 moribund. Those still living at that time were sacrificed 72 hours after the last injection, and no difference in the concentration of the adrenal cholesterol was found between the test and control groups although the values were lower than in normal animals. Under similar experimental conditions 0.5 mg. ascorbic acid per 100 gm. of body weight added to the injected solutions, maintained the cholesterol of both groups at normal concentration and the ascorbic acid at a low but measureable amount. Liver ascorbic acid was lower in 24 hours, but higher in 48 hours after alcohol intoxication than in corresponding glucose controls. This difference between test and control animals tended to disappear 72 hours after the stress, and may indicate no greater loss from the body because of the adrenal stimulation.

11. The Possible Role of Psychological Factors in Causalgia.

M. G. Mitts; *Medical College of Virginia.*

Causalgia is a peripheral nerve injury syndroms with an unusual clinical pattern. Among the many manifestations of this disorder include intense burning pain, dry skin, hyperthermia, wasted muscles, and in some cases function loss in the affected limbs.

Causalgia occurs mainly in the hand and foot, and follows injury to large nerves, arterial or venus occlusions, fractures, sprains, infected wounds, and other minor injuries. There is considerable perplexity regarding the rather devastating symptoms following such a restricted injury.

The physiological mechanism is not understood, but it is known that the injured region in causalgia gives unusual potentials, This information along with the data on facilitation may be a possible basis for an explanation, but it leaves unexplained the dramatic effects which psychological changes bring about. While neuro-surgical methods sometimes alleviate the symptoms, there is no therapy known which can be considered a satisfactory remedy. There is scattered and fragmentary evidence to suggest

psychological factors may be important not only in the etiology, but in the termination of the disorder.

It is suggested that serious study should be given to possible use of psychotherapy in this syndrome.

12. Potentials from Pancreatic Acini.

S. Solomon; *Department of Physiology, Medical College of Virginia.*

A method has been described, which it is felt, allows for direct measurement of mouse pancreatic acinar cell electrical potentials in vivo. It consists essentially of using fine microelectrodes for a lead and measuring directly transmembrane potentials. Although some evidence can be presented to show that the electrode enters the cell, explicit proof is still lacking.

It has been found that the inside of the acinus is negative to the outside, with fed animals having lower measured values than sixteen hours starved animals. The range of mean values runs from 40 to 120 millivolts. In the resting state the potential is maintained for periods longer than three hours. It is depressed by .001 M iodoacetate and seems to be partly inhibited by .001 M NaCN.

BUSINESS MEETING

The following officers were elected for the Section of Medical Sciences for 1953-1954:

Chairman: D. H. R. Gourley
Secretary: Sidney Solomon
Section Editor: Ebbe Hoff

MINUTES OF THE SECTION OF PSYCHOLOGY [10]

S. B. WILLIAMS, *Chairman*
L. S. REID, *Secretary-Treasurer*
W. M. HINTON, *Executive Committeeman*
R. H. HENNEMAN, *Section Editor* (1954)

FRIDAY, MAY 8 – 9:00 A.M. – ROOM 359, MALLORY HALL

1. The Relative Effectiveness of Auditory and Visual Messages under Conditions of Noise.

James G. Holland; *University of Virginia.*

Two experiments were reported extending the findings of a series of studies which indicate that a distracting task interferes more with visual than with audtiory message reception. The present study found that the differential influence of distraction extends also to the reception of distorted messages. It was further demonstrated that one previous presentation of a set of messages in non-distorted form enhances intelligibility under the dual conditions of distorted presentation and distracting task. However, no evidence was found to indicate that the introduction of familiarity affects reception through one sense channel to a greater extent than another.

It was concluded that neither message familiarity nor message distortion at the time of presentation removes the relative superiority of auditory presentation which occurs when subjects are engaged in a highly distracting task.

2. The Course of Cutaneous Adaptation to Audio-Frequency Currents.

Andrew W. Gottschall, Jr.; *University of Virginia.*

The results of preliminary control explorations indicate that the variables of stimulus intensity, body locus, electrode type and size, and the distance between electrodes are critical to the production of experience of cutaneous vibration.

The advantages of the intensity comparison method, as opposed to the threshold method for the study of the course of adaptation are discussed. Results of an additional control experiment indicate that adaptation effects are restricted to the ipsi-lateral side. Therefore, contralateral comparisons will be made in the study of the course of adaptation, as a non-affected area is required for the comparison stimulus.

3. Stability of Color Preference.

Walter A. Woods; *Richmond Professional Institute.*

Color preference studies, conducted over a period of many years, have revealed rather inconsistent results. Some investigators have doubted the value of such studies, since a lack of stability is suggested in results.

The present study investigates three hypotheses conecrning stability of color preference.

(1) Preference for colors expressed by a selected group of observers are stable over a period of three months.

(2) Preference for colors is influenced by the particular choices offered to the observer group.

(3) Differences in color preferences may be demonstrated between stratified samples of observers.

Munsell system notated color samples were submitted for judgement to a number of different normal and psychotic groups. Results are discussed and variations and significance of date noted. Typical color preferences are discussed with reference to previous studies. Conclusions arrived at are:

(1) Color preferences tend to remain stable over a period of six months.

(2) Color preference is a function of choice of colors offered.

(3) Difference in color preferences exist between typical consumer groups, sophisticated consumers, "bizarre" consumers, psychotic females and psychotic males.

4. Non-Reinforced Training in the T-Maze.

Melvin Freitag; *University of Virginia.*

This study was an attempt to obtain latent learning in the absence of any primary reinforcer during training. The 24 experimental rats were given 26 unrewarded trials in a T-maze having a left black and a right white goal-box. Twelve control animals received equal training in an all gray T-maze. Half of the experimental and all of the control animals were given rewarded post-training trials in a straight alley apparatus where they received food in the goal-box corresponding to the brightness cue of their least preferred side during training. These discrimination trials continued until a learning criterion of 7 out of 8 correct choices was reached. Each animal in the remaining half of the experimental group received the same number of reinforcements as their matched running mate in the other experimental group in a straight grey runway with the least preferred goal-box attached. All animals were then tested in the original T-maze. Test trials were continued at 24-hour intervals until a learning criterion of 7 out of 8 correct choices was reached. There was no significant difference

between groups on the choices made on the first test trial or in the number of trials to reach the learning criterion in the test phase.

5. An Experimental Test of the Estes Versus the Bush and Mostellar Theories of Learning.

Beth Forester and Burton R. Wolin; *College of William and Mary.*

This experiment was designed to test two mathematical theories of learning, Estes versus Bush and Mostellar, in an human conditioning situation. The independent variables included the percentage of reinforcement, the amount of work involved and the position of the telegraph key to which the subjects were being conditioned. Of these, percentage of reinforcement had the greatest effect. It was found that the interaction of work and reinforcement had a significant effect upon the speed of conditioning. The effect of work alone was obscured by the male-female variable, which was not counterbalanced. It seems that work affected the speed of females but not of males. It is suggested that another experiment be designed in which all subjects are of the same sex.

6. The Use of Continuous Addition Technique in Psychological Diagnosis.

Vytautas J. Bieliauskas; *Richmond Professional Institute.*

The technique of continuous addition was designed by E. Kraepelin around 50 years ago for psychiatric purposes. R. Pauli has improved, standardized and established its value for examination of normal people, especially for diagnostic survey of personality.

The Pauli version of the technique, as we have it now, is still based upon the Kraepelin principle of continuous adding of digits. The addition takes one hour which is divided into 20 intervals (three minutes each). During testing, observations are carefully registered and an inquiry at the end supplies the introspective data. The interpretation of the whole test consists of two parts: statistical and diagnostic. An apparatus and other facilities simplify the statistical work; the diagnostic part uses standardized charts elaborated by R. Pauli. This author has done a research with 30 college students, and he presents statistical and diagnostic results achieved with this experiment.

Conclusions: The technique offers great possibilities for precise psychological diagnosis, and it has the advantage over many diagnostic tests in that it can be administered to bigger groups at a time; however, elaboration and interpretation are difficult and time consuming. A shorter version of this technique is submitted by the author. A comparison of both versions shows that the "new version" limits the diagnostic value of the test and gives less possibilities for elaboration of an overall psychological opinion, although it is valuable for fast appraisal of certain single per-

sonality traits. Since the technique allows a graphic description of the course of performance, its value for industrial psychology is obvious.

7. Serial Effects as a Function of Inter-stimulus Interval.

Willard F. Day; *University of Virginia.*

8. The Development of Syllogistic Reasoning in Children Five through Eleven Years of Age.

Charles A. Peachee, Jr.; *Central State Hospital.*

In this investigation the two premises of ten simple, valid categorical syllogisms were presented to 140 school children (individually tested) of average intelligence and between the ages of five and twelve. The resulting conclusions were scored according to their degree of accuracy and quality, a total score being given for each child, and these scores being quantitatively and qualitatively analyzed in respect to age and sex differences. Syllogistic reasoning was found to increase gradually with age, reaching a near peak at the 10-11 age level. A highly significant spurt in this ability was discovered at the 7-8 age level. No statistically significant sex differences were found. The Similarities Test of the Wechsler Intelligence Scale for Children was administered along with the Syllogisms Test, since the former is regarded as a test of reasoning, and the two tests correlated .67, suggesting, but by no means proving, that they are measuring a similar function.

The results were compared with the findings of Piaget, who studied French children's logicality of thought in the 1920's, and Bieliauskas, who investigated German children's syllogistic reasoning ability in 1942. These results are considered to have important implications for the fields of education and child guidance in general.

9. Tactual Apparent Movement.

Raymond C. Bice; *University of Virginia.*

Movement illusions have been of considerable importance in the history of experimental psychology. Early workers demonstrated that tactual apparent movement could be produced by successively stimulating adjacent areas of skin with non-vibrating stimulators, and that the illusions follow the laws of Korte. Hulin noted a vagueness about the perceived movement, pointing out that even under optional conditions the illusion is not always perceived.

Recent work at the Virginia laboratory has shown that clear illusions of movement may be obtained by use of vibrating stimulators. Low frequencies (below 100 cycles per second) give more diffuse sensations than do the higher frequencies. Further investigations are under way attempting to utilize the vibratactile illusion of movement for purposes of conveying information to a human subject.

10. Sweetness and Food Consumption.

William Wagman; *College of William and Mary.*

Three equated groups of white rats were fed:

1. a normal diet of powdered Purina dog chow
2. a normal diet with .1% saccarhine added; and
3. a normal diet with 1% saccarhine added.

The groups were rotated systematically on the three diets so that each group ate all three diets in different but balanced orders.

The amount of food eaten daily was approximately the same for all diets. Hence it is argued that sweetness alone does not normally cause increased food consumption, although studies by other investigators have indicated that sweetness does increase water consumption.

11. A Study of the Voice as Related to Personality Traits.

Cora Lynn Chaffee; *Richmond Professional Institute.*

This study was undertaken out of an interest in voice as a form of expressive movement. From various studies regarding the voice this investigator formulated a table of voice qualities and their possible meanings as to the personality of a person.

The voices of twenty subjects, five female and five male college students and five female and five male inmates of Virginia state penal institutions were recorded. Each subject read the same two selections and was asked to talk briefly spontaneously. Immediately following the making of the recording and the obtaining of background information, each person was given a Rorschach. These voices were later judged by nine psychology students according to the formulated chart. The judgments by the chart were then compared with the Rorschach findings.

There was positive statistical evidence that the overall impression regarding a given person gained from the voice and from the Rorschach was in agreement. However, the judging of specific personality traits from specific voice qualities was not substantiated.

12. Physical Dimensions Related to the Perception of Mechanical Vibration.

Carl E. Sherrick, Jr.; *University of Virginia.*

Consideration is given to some properties of the skin and underlying tissues which may contribute to the variation of sensitivity of the human observer with frequency of mechanical vibration. From the investigations of Geldard it is assumed that dense clusters of receptors sensitive to vibration do not respond selectively to various frequencies of vibration. The skin is considered a a mechanical system possessing the fundamental

properties of mass, elasticity, and friction, and from these assumptions the U-shaped sensitivity curve for vibration usually obtained is explained as being a result of resonance of the skin tissues.

It is predicted that if the skin acts as described, then (a) skin conduction of vibratory disturbance should be greater at the frequency of maximal sensitivity, and (b) the mechanical impedance of the skin should be a minimum at the frequency of maximal sensitivity. Experiments were carried out to determine the validity of these hypotheses, and the results appear to confirm the hypotheses. It is suggested that future research should attempt to quantify these relations to determine the relative contributions of skin and bony tissue and of receptors and nerves.

13. A Study of Anxiety in the Minnesota Multiphasic Personality Inventory.

William E. Cook; *Richmond Professional Institute.*

Although many recent studies have involved the Iowa Test of Manifest Anxiety, no studies have yet related anxiety as measured by this test to the variables measured by the Minnesota Multiphasic Personality Inventory (MMPI). This study is concerned with these relationships. A key was constructed from the Iowa anxiety test which could be utilized within the MMPI. Overlap of this key with commonly-used MMPI keys is presented and discussed. The MMPI was administered to the 127 students in a general psychology class at the University of North Dakota. Answer sheets were scored for all commonly-used scales of the MMPI and for the anxiety key. Zero order correlations of each scale with anxiety for this group of subjects is presented and discussed. Mean profile scores and variabilities for anxious and non-anxious groups are presented and discussed. The relationship between anxiety as measured by the Iowa Test of Manifest Anxiety and anxiety as measured by the Welch Anxiety Index is determined and discussed. Other relevant studies are discussed in relation to these findings.

14. A New Short-cut Method of Psychotherapy for Psychoses.

John A. Blake; *Central State Hospital.*

The method of psychotherapy for psychoses herein outlined has been under experimentation and in actual use by the author in a mental hospital situation since September 1951. Although occasionally incorporating a few recognized special techniques of the "directive" method as variants, it claims to be generally a new, distinctive procedure. This claim is based upon the inherent characteristics of the following aspects: Scope of application, limitations to effectiveness, rationale of the method, general nature of the "Illumination" method, specific techniques, and desirable follow-up procedures.

BUSINESS MEETING

The business meeting was opened by the Chairman, Stanley B. Williams, at 2:00 P.M. He reported briefly on his activities for the year and appointed a nominating committee consisting of Miss Davis, Miss Shuey, and Mr. Finger (Chairman).

Mr. Finger, in the absence of the Secretary, reported a membership of 82 and pointed out the steady decline in the number of student affiliates associated with the section. He also read the Treasurer's report which recorded receipts of $234.50 and disbursements of $228.00, leaving $6.50 to be disbursed. Of the disbursements, $198.00 went to the Academy treasury and $30.00 to the Conference of State Psychological Association.

Mr. Hinton, delegate to the Conference of State Psychological Associations, reported that the Conference favors accrediting legislation at the State level whenever it is needed to protect the public interest, and that the Conference when requested, will support the efforts of any State association which decides to sponsor legislation. Mr. Horlick moved that the section go on record as favoring the Conference's position. Mr. Horlick's resolution was passed.

The report of the Executive Committee was presented by the Chairman, Mr. Williams.

Following this report there was a lengthy discussion on the possible reorganization of the section. It was suggested that psychologists in various regions of the State might organize to hold local meetings, and Mr. Horlick moved that the Executive Committee be instructed to consider the feasibility of renaming the section the Virginia Psychological Association, an affiliate of the Virginia Academy of Science. This resolution was understood to include investigation of the legal requirements regarding the certification law, and consultation with the Academy. The motion was passed.

The report of the nominating committee was presented and the following persons were elected officers for the coming year:

President: Stanley B. Williams

Secretary-treasurer: Hannah S. Davis

Executive Committeeman: Reuben S. Horlick

Business meeting adjourned at 3:30 P.M.

MINUTES OF THE SECTION OF SCIENCE TEACHERS [11]

THOMAS H. CHRISTIE, *Chairman*
CAROLINE GAMBRILL, *Chairman-Elect*
MARTHA W. DUKE, *Secretary*
L. W. JARMAN, *Section Editor* (1954)

FRIDAY, MAY 8, 1953 – 9:00 A.M. – ROOM 252, MALLORY HALL

1. Embedding Biological Specimens in Plastics.

Howard H. Edgerton; *Carolina Biological Supply Company.*

A. Plastic embedding can serve as a motivation for participation in the total laboratory experience.

B. It can provide for concomitant learning for the student.

C. Plastic embedding serves the science museum with mounted specimens.

D. It makes an interesting hobby for the amateur collector who wishes to display his collection permanently.

Amber is a natural resin; plastic is a synthetic one. It was amber which inspired the chemist to adapt plastic to biological embedding. Plastic comes in the form of a heavy syrup and will gel to a rubbery mass with the addition of a catalyst. After it has gelled it is cured in a temperature of 120-140 degrees F., which results in a glass-like hardness.

The plastic technique then is a two-step process – gelling and curing.

Specimens may be mounted in one of three ways – transparent, wet-opaque, or dry-opaque.

First of all specimens have to be prepared – 70% alcohol or 10% formalin.

1. Transparent – Stain, dehydrate, sock in uncat. plastic, embed.
2. Wet-opaque – Air dry, embed.
3. Dry-opaque – Wet in plastic and embed.

Holds may be any smooth surfaced containers which adequately accommodate the specimens.

The embedding procedure goes like this:

1. Measure the thickness of the specimen.
2. Estimate the quantity of plastic which will give ¼″ in a base layer and ¼″ above the specimen in the chosen mold.

3. Estimate the total thickness of the mount and look up proper catalyst ratio of the catalyst table.
4. Catalyze and pour a base layer of plastic and cool.
5. Catalyze and pour a second layer and cool.
6. Cover with wax paper and cure.
7. Finish mount with sand paper to produce a smooth surface, and polish with buffing compound.

2. Preparation for College Chemistry.

William G. Guy; *William and Mary College.*

We need a closer relationship between the colleges and secondary schools. Three problems present themselves:

1. Does the high school do college work?
2. Does the college do high school work?
3. Do we ignore each other?

In the high school we have two types of students, those entering college and the student taking his only course in chemistry. How can we challenge the upper tenth and still make the work valuable to the non-college type? The unit system should provide an answer, here we can insert more difficult material to be worked on after the basic work is done. In every class we should make the historical approach first, give the students an appreciation of the past, then we can develop methods, observations, and arrive at principles.

3. Atomic Energy in High School Science Courses.

Captain C. E. Savage; *Augusta Military Academy.*

1. Integration of Physics and Chemistry Students
   a. Placement and importance of study in a high school course.
   b. Alternate days – Atomic energy from a chemistry standpoint, and then from a physics standpoint presented.
2. Introduction and Stimulation of Interest
   a. Atomic bomb records – RCA Victor set – Bob Hope.
   b. Presentation by comic books – Dagwood Splits the Atom
3. Laboratory Techniques
   a. Balancing equations
   b. Use of workbook
   c. Introduction of Geiger Counter
4. Geiger Counter Experiments
   a. Field trips to collect material which may be radioactive.

b. Laboratory experiments with known radioactive materials.

1. Effect of Lead, Aluminum and Cardboard as absorbers.
2. Distance of effectiveness of each.

5. Presentation of A.E.C. Tape-Recorded Story of Atomic Energy.
6. Testing Program Used
   a. Quiz on atom and hydrogen bomb records.
   b. Quiz prepared by A. E. C.
7. Reading Materials for Outside Study
   a. Various sources — books on atomic energy and on splitting the atom.
8. Summary of Importance in the course and Reference to Civilian Defense.
9. Demonstration of Materials Used at A. M. A. (throughout the speech).

3. Use Techniques in Elementary Science.

John C. Wells; *Madison College.*

Six student teachers from Madison College presented a demonstration of science topics that could be taught in the elementary grades. Simple yet pertinent equipment was used to emphasize the principles in lighting the home, using the telephone and radio. All equipment could be assembled and put together by the more advanced students in the elementary grades.

Paul Desper, a student from Wilson Memorial High School, Fishersville, read his paper on "Measurement', which was his project in the Science Talent Search of 1952-53.

BUSINESS MEETING

The meeting was called to order by the chairman. The nominating committee presented the following slate:

Chairman-elect: G. L. Thomasson
Secretary: Martha W. Duke

As there were no nominations from the floor, these officers were declared elected.

Forty members attended the meetings of the section.

MINUTES OF THE SECTION OF STATISTICS [12]

A. M. MYSTER, *Chairman*
G. W. SUTER, *Vice-chairman*
C. Y. KRAMER, *Secretary*
W. A. HENDRICKS, *Section Editor* (1954)

FRIDAY, MAY 8 – 10:00 A. M. – ROOM 237, MALLORY HALL

1. On the Analysis of Variance of a Multiway Classification with Unequal Sub-Class Numbers.

Clyde Y. Kramer and David B. Duncan; *Virginia Polytechnic Institute.*

This paper reviews important current methods on the analysis of variance of a multiway classification with unequal sub-class numbers, presenting them from a unified point of view and also proposes a new method which has special advantages for particular situations.

For cases in which no interaction is present, the most efficient procedure is the method of fitting constants. The method of weighted squares of means is much simpler to apply but would generally sacrifice too much efficiency. The virtue of the new method is that it is equally simple for such cases and is more efficient than the method of weighted squares of means.

There are situations in which this would not be true and in which case the method of weighed squares of means should be used. A quick test for recognizing situations of this type is provided.

The new method tends to give weight to sub-class means more in proportion to the numbers on which they are based than does the method of weighed squares of means. When the number of sub-classes are large the time and effort saved by the proposed method may outweigh the loss of efficiency.

2. Some Aspects of the Comparisons of Experiments.

David Blackwell; *Howard University, Washington, D. C.*

A set of n alternative hypotheses about the distribution of a variable with k values is specified by an $n \times k$ matrix $P = ||P_{ij}||$, called an experiment, where P_{ij} is the probability of value j under hypothesis i. For two experiments P and Q with the same n, two equivalent formulations are given for the concept that P is more informative than Q, writ-

ten $P \supset Q$. For $n = 2$, i.e. testing a simple hypothesis against a simple alternative, let $\beta_P(\alpha)$ be the probability of a type two error in experiment P using the Neyman–Pearson likelihood ratio test at level α. For this case $P \supset Q$ if and only if $\beta_P(\alpha) \leqslant \beta_Q(\alpha)$ for all α. This fact yields that $\beta_P(\alpha) \leqslant \beta_Q(\alpha)$ for all α implies $\beta_{P^r}(\alpha) \leqslant \beta_{Q^r}(\alpha)$ for all r, α, where (P, r) [(Q, r)] is the experiment with r independent observations of P[Q]. Some normal and binomial examples are given.

3. Quality Control Applied to Routine Counting of Bacterial Plates.

Clifford J. Maloney; *Camp Detrick, Frederick, Maryland.*

A special experiment on factors affecting the accuracy of routine counts of bacterial plates revealed the presence of irratic disturbances which increased the coefficient of variation to about 3 times the theoretical value given by the Poisson distribution. When plotted on a quality control chart these values appeared as points out of control not only compared to theoretical control limits calculated from the Poisson distribution but compared to observed limits based on the 3-fold inflated variance. On the basis of this result a trial was made of quality control applied to the regular counts of the laboratories. Calculations were done on a Remington Rand punched card installation, the quality control results being obtained as a by-product of other required calculations. While it was not possible to isolate specific sources of increased variability in the counts, the Poisson index of dispersion was reduced to about one and one-half the theoretical value. It was found that expressing the observed index as a per cent of theoretical made it quite easy for applied people to grasp the significance of the result. Recently a scheme involving a probability scale has been tried.

4. Paired Comparisons in a Lattice Design.

Boyd Harshbarger; *Virginia Polytechnic Institute.*

This is a design for factorial experiments in which the treatment combinations are grouped in pairs and contains the features of the "Latinized Rectangular Lattices" (see Biometrics, The Biometric Society, March 1952, Vol. 8, No. 1). It enables the estimation of variability between rows and columns and at the same time gives efficient adjustments to the incomplete blocks. Following the adjustments involved in the "Latinized Rectangular Lattices" standard significance tests can be made using the principles of factorial designs. The theory is applicable to a larger number of treatments.

These designs have great possibilities for factorial problems in certain animal experimentation, in some food experiments, and in some special agronomic problems where two-way variability must be removed before studying the factorial effects.

5. Multiple Range Tests and the Multiple Comparisons Test (A Preliminary Report).[1]

David B. Duncan; *Virginia Polytechnic Institute*

Several methods are available for testing differences between treatments in an analysis of variance. The two considered most satisfactory are one by Newman (1939) and Keuls (1952) and the Multiple Comparisons Test by Duncan (1951). Both employ repeated homogeneity tests. The Newman-Keuls test is simpler because it uses repeated range tests instead of F tests as used by the Multiple Comparisons Tests. The latter is generally more sensitive owing partly to this reason but mostly to the relaxation of the significance levels of some of the tests considered to be of diminished importance. This paper presents: a new Multiple Range Test which achieves the simplicity of the Newman-Keuls test by using range tests and most of the sensitivity of the Multiple Comparisons Test by using the special significance levels, and an improved set of application rules for the Multiple Comparisons Test. Each of these is recommended for use depending on the relative needs for simplicity or sensitivity. The special system of significance levels is discussed in some detail. The author is indebted to W. Beyer in the determination of significance ranges for the new test which is still in progress.

6. The Air Force Univac System.

Joseph V. Natrella; *United States Air Force.*

The purpose of the Air Force Univac System is to assist in solving a difficult management problem – planning the operations of the Air Force on a business-like basis. Its use can result in a great reduction in the time and man hours needed to test program implications. Magnetized tape spots are used to communicate with the machine. These coded spots are compact storage for alphabetic and numeric data. The Unityper types characters on tape. Uniservos read data on tape into machine storage registers. They can also write information on tape from the registers. The central computer contains the storage register memory and the arithmetic unit for computation. High speeds are a result of electronic tubes and electronic circuits. Human control is exercised by a switch console, supervisory control. Its lights can show the operator what is being done at various problem stages. Results recorded on tape are translated into typewritten copy by the uniprinter. The card-to-tape converter transcribes data from punch cards to magnetic tape. Instructions must be prepared for the machine to compute. This coding must precede the computation, and provide the automatic control of the computer.

7. Computation of a Linear Programming Problem.

Lt. James V. Kelley; *United States Air Force.*

[1] Sponsored by the Office of Ordnance Research, United States Army.

The linear programming problem considered in this paper is as follows: Given a system of linear inequalities and a linear form; find a non-negative solution to the linear system for which the greatest lower bound of the linear form is obtained. The background of the problem is explained in terms of its application to certain optimization problems in military planning.

The paper describes the so-called "simplex' method of solution which, although derived for only a small class of problems termed non-degenerate, generally yields optimum solutions. Certain inadequacies of the technique are mentioned, and it is shown that the method compares favorably with the elimination technique for inverting matrices.

Finally, the use of an electronic computer (Univac) to solve the problem is discussed. Some of the computational difficulties involved in solving large systems and some of the results of probiems solved are given. Variations and extensions of the original problem are briefly mentioned.

8. Extension of the Multiple Comparisons Test to Incomplete Block Designs—II.[2]

Edwin Bleicher and David B. Duncan; *Virginia Polytechnic Institute.*

The purpose of this paper is to extend the Multiple Comparisons Test for use in unbalanced lattice designs. A triple lattice with nine treatments and three replications is employed to aid in the development of the test. The Multiple Comparisons Test is not directly applicable to testing the differences between treatment means in this design because of the correlation betwen the treatments. It is shown, however, that a useful approximation can be obtained by proceeding as though the treatment means were uncorrelated provided the variance of a treatment difference is replaced by one-half the average variance of a difference between two treatments. This result depends on an extension of the material discussed by Sanders and Duncan (see abstract herewith) for balanced lattices. The variance-covariance matrix of the difference between treatment means is determined. It is demonstrated that the covariance between differences not having a treatment in common is zero and the average of the remaining covariances is one-half the average variance of the treatment differences. Thus, the approximate procedure can be used with the same assurance as is customarily associated with the replacement of the individual variances by the average variance of such differences.

9. Some Further Extensions of the Rank Analysis of Incomplete Block Designs. (A preliminary report).

Ralph Allan Bradley; *Virginia Polytechnic Institute.*

The paper is introduced with some comments and comparisons on re-

[2] Sponsored by the Office of Ordnance Research, United States Army.

cent work on paired comparisons by Fred Mosteller, Henry Scheffe, and the present author with M. E. Terry. One point of emphasis showed that the Mosteller-Thurstone model can be summarized by the integral and the Bradley-Terry Model by

$$\pi_{ij} = \frac{1}{\sqrt{2\pi}} \int_{-(S_i - S_j)}^{\infty} e^{-1/2\ y^2} dy$$

$$\pi_{ji} = 1/4 \int_{-(\log_e \pi_i - \log_e \pi_j)}^{\infty} \operatorname{sech}^2 \frac{y}{2} dy$$

where in each formula π_{ij} is the probability that item i is rated above item j in a paired comparison. S_i and $\log_e \pi_i$ are in the different notations location points for item i on a subjective continuum.

The main body of the paper deals with limiting large sample distributions. Likelihood ratio tests are used for the paired comparisons and the statistic is shown to have a chi square distribution in the limit when the null hypothesis is true and an asymptotic normal distribution for the power function. The variance and mean of the normal distribution are very complicated functions of the postulated parameters π_i and it is indicated that some further work may be required on this point.

10. Extensions of the Multiple Comparisons Test to Incomplete Block Designs–I.[3]

Paul G. Sanders and David B. Duncan; *Virginia Polytechnic Institute.*

The Multiple Comparisons Test (Duncan, 1951) is a procedure for testing the differences between ranked treatments in an analysis of variance. It has been designed for the fairly common case in which the treatment means are independent and have the same expected variance. The purpose of this paper is to extend this test for use in balanced lattice designs. It is shown that, although the treatment means in a balanced lattice are correlated, differences between means have a similar variance-covariance matrix to that of differences between uncorrelated means in the following respects. The variance V(d) of each treatment mean difference is constant. The covariance of each pair of treatment mean differences involving a common treatment is the same for all such pairs and is equal to ½V(d). The covariance between each pair of treatment mean differences not containing a common treatment is zero. From this it is

[3] Sponsored by the Office of Ordnance Research, United States Army.

shown to follow that a Multiple Comparisons Test may be applied to the differences between correlated treatment means of a balanced lattice by the same method as that used for uncorrelated treatment means provided that the variance of a treatment mean is replaced by ½V(d).

11. A Modification of the Aitken-Neville Interpolation Formulae.

M. C. K. Tweedie; *Virginia Polytechnic Institute.*

Aitken (Proc. Edinburgh Math. Soc., series 2, 3 (1932), 56) has described an interpolation procedure which is convenient for use with a desk calculator and requires neither that either variable should be tabulated at uniform intervals nor that differences need be calculated. Neville (Journal Indian Math. Soc. (1933), 87) has given a modification of the same idea, and the present paper gives a further alternative. Each version has some advantages over the others. Aitken's general technique computes a succession of interpolates, each giving the same result as fitting a polynomial to all the values on which it is based. These interpolates are each obtained by a method equivalent to a linear interpolation between two interpolates (chosen by different rules in the three versions) obtained at an earlier stage in the process. The required interpolate appears at the ultimate stage when every given value has been included, and is the same by all three methods. The new method generally provides intermediate interpolates which are closer approximations to the ultimate interpolate than do the Aitken and Neville procedures at corresponding stages, and are the most satisfactory if the computations may later need extending to give an ultimate interpolate of higher order.

12. Quartermaster Board Test of a Detergent.

Elie Weeks; *Quartermaster Board, Fort Lee, Virginia.*

During the period from December 8, through March 20, the Quartermaster Board, Fort Lee, Virginia, conducted a user test of a new type of detergent at 10 Army posts located in hardwater areas of the middlewest and far-west. The purpose of the test was to determine: (1) The optimum concentration for washing dishes, pots or pans, and woodwork; (2) The efficacy of soil removal; (3) The ratio of that used compared with G. I. bar soap; (4) Economy of storage and shipping space; and (5) The effect on the hands of the users. Test data was generated by means of questionnaires, interviews, and weighing the amount of G. I. soap and detergent used for cleaning operations. Objective data on efficacy of soil removal from dishes and trays was obtained by staining washed utensils with a fluorescent dye (primuline) and exposing them to an ultra-violet light.

13. Use of I. B. M. Equipment in Statistics.

Richard G. Cornell, *Virginia Polytechnic Institute.*

When it is necessary that an arithmetic process be done repeatedly,

I. B. M. equipment may save both time and labor. Such situations arise in statistics in the computation of tabular values corresponding to different values of independent variables and in the analysis of variance. This paper is mainly concerned with the use of I. B. M. equipment in the computation of significance levels for certain experiments designed by Bradley and Terry at the Virginia Polytechnic Institute to test subjective data. Besides a series of several thousand multiplications and additions, these computations involved an iterative process for solving equations in several unknowns. I. B. M. equipment was used to record data on cards, to group data, and to list results as well as to do the actual computation.

14. The Analysis of Variance on I. B. M. Calculators.

Robert M. Abelson; *Virginia Polytechnic Institute.*

The purpose of this paper is to demonstrate the calculations necessary in an analysis of variance on automatic equipment. When data is presented in mark sense form on punched cards, a substantial saving in time needed for calculations may be obtained by the use of punched card calculators. This method will also result in an increase in accuracy over the use of desk calculators due to the tedious calculations of sums of squares. This method is particularly useful when a large number of separate analyses are to be done at the same time.

15. Certain Percentage Points of the Distribution of the Range of Large Samples.[4]

William H. Beyer; *Virginia Polytechnic Institute.*

This paper is concerned with the derivation of $100\,\alpha_n$ percentage points of the studentized range, where $\alpha_n = 1 - (1 - \alpha)^{n-1}$, $\alpha = .05,\ .01$, $n = 2(1)20$. These values are required for multiple range significance tests.

The studentized range is defined as $q = w/s$. Here w is the range in a random sample of size n drawn from a normal population with variance σ^2, and s^2 is an estimate of σ^2 with ϕ degrees of freedom.

We use $\phi P_n(Q)$ to denote the probability that the variate q will not exceed any fixed value Q. The required significance points for Q satisfy $\phi P_n(Q) = 1 - \alpha_n = (1 - \alpha)^{n-1}$, and can be formed by inverse interpolation from values of $\phi P_n(Q)$ computed at suitable trial values of Q. Tables of $P_n(Q)$, $a_n(Q)$ and $b_n(Q)$, for $n = 2(1)20$, have been given by E. S. Pearson and H. O. Hartley (Biometrika, *33,* (1943-46), 89), by which $\phi P_n(Q)$ has been computed by H. O. Hartley's (Journal of the Royal Society Supplement, *5,* (1938), 80; Biometrika, *33,* (1943-46), 173) approximate formula

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$$\phi P_n(Q) = P_n(Q) + \frac{1}{\phi} a_n(Q) + \frac{1}{\phi^2} b_n(Q),$$

with $\phi \geqslant 10$.

For smaller values of ϕ, it has been necessary to add a term in $\frac{1}{\phi^3}$ to this formula. This paper includes an account of the derivation of this new approximation by a somewhat more direct method than Hartley's.

16. Confidence Intervals for the Differences Between Treatment Means in an Analysis of Variance.[5]

Robert G. Bonner and David B. Duncan; *Virginia Polytechnic Institute.*

A comparison is made of several of the available procedures and that of a proposed new method for obtaining confidence intervals for the differences between treatment means in an analysis of variance. The new method is an extension of the Multiple Comparisons Test, Duncan (1951). The intervals obtained are complex in that the limits for each difference are functions of the expected values of the remaining differences. Alternative methods for resolving these complexities are discussed. In each case the resulting intervals are shorter than those of the previous methods.

BUSINESS MEETING

The following were elected to serve as officers of the Section of Statistics for 1953-1954.

Chairman: Ralph A. Bradley
Vice-chairman: William Cooke
Secretary: C. Y. Kramer

[5] Sponsored by the Office of Ordnance Research, United States Army.

LIST OF MEMBERS
1952-1953

Note: Following are the types of membership in the Academy.

•••*Patrons*, who contribute one thousand dollars or more to the Academy.
••*Life Members*, who contribute one hundred dollars or more to the Academy.
••*Honorary Life Members* (Elected by Council).
•*Sustaining Members*, who pay annual dues of ten dollars.
†*Contributing Members*, who pay annual dues of five dollars.
Regular Members, who pay annual dues of three dollars.
Student Members, who pay annual dues of two dollars. (restricted to college students only).

Note: Number following name designates section, or sections, to which member belongs.

1. Agricultural Sciences
2. Astronomy, Mathematics, and Physics
3. Bacteriology
4. Biology
5. Chemistry
6. Education
7. Engineering
8. Geology
9. Medical Sciences
10. Psychology
11. Science Teachers
12. Statistics

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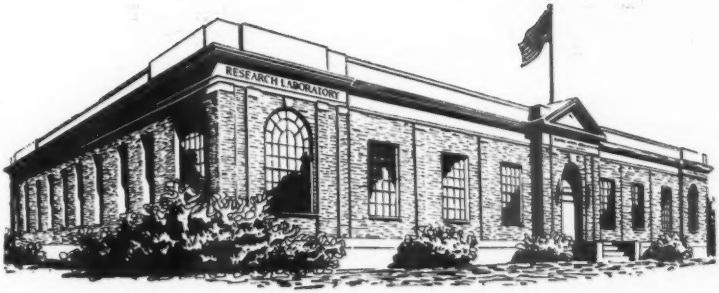

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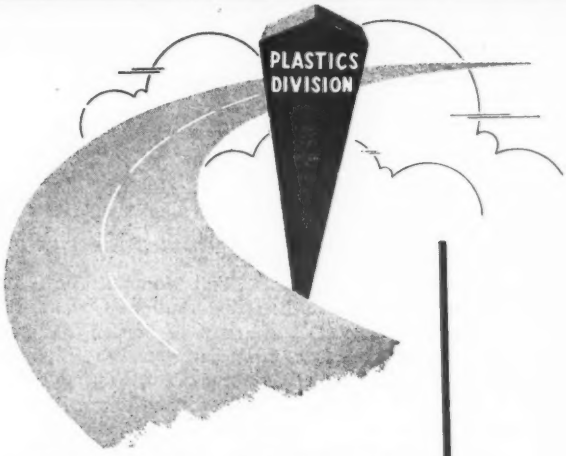

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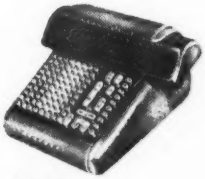

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